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ABSTRACT

This document contains the following papers on the educational computing course from the SITE (Society for Information Technology & Teacher Education) 2001 conference: "Using a Flexible Format To Create a Constructivist Learning Environment in the Educational Computing Course" (Wren M. Bump); "Technological Diversity: Managing Differing Technology Skills in the EdTech Course" (David C. Byrum); "Contextual Experiences: The Revision and Implementation Process of an Information Technology Course for Master Teachers" (Wanda I. Carrasquillo-Gomez and David K. Stokes); "Comparison of Face-To-Face, Semi-Online, and Fully Online Approaches for Introduction to Educational Technology Courses for Educators" (Cathy Cavanaugh and others); "Redesigning an Educational Computing Course To Meet New National and State Technology Initiatives" (Linlin Irene Chen); "Technology--Stand Alone or Integrated?" (Sue Espinoza and others); "The Anatomy of an Educational Technology Seminar" (Sebastian Foti); "Technology Education and Integration: A Position Paper on Attitude, Perspective and Commitment" (Jerry P. Galloway); "Traeger Technology Target: Completing the Circle of Community" (Penny Ann Garcia); "On-Line Exams: Design, Development and Implementation" (Taralynn Hartsell and Steve Chi-Yin Yuen); "Using Anchored Instruction To Teach Preservice Teachers To Integrate Technology in the Curriculum" (Mumbi Kariuki and Mesut Duran); "Challenges to Currency in the Educational Computing Course" (Kathy A. Sisk); "Architecture of a Cooperative Hypermedia" (Lafifi Yacine); "Freeing the Monkeys: Making the Ed Tech Course More than Learning To Push Buttons" (Daniel Laughlin and Sarah Irvine-Belson); "Surfing Safely with Social Navigation" (Bruce Lewis); "Collaborative C4ommunities Think about Technology in Education: A Web-Based Constructivist Course Model for Pre-Service Teachers" (Sharon Murray); "Revising an Educational Computing Course To Meet the National Educational Technology Standards (NETS): A Process of Reflective Teaching" (Aileen Nonis and Blanch O'Bannon); "Enhancing Educators' Computer Learning with the Emerging Technology" (Alex C. Pan); and "A Collaborative Course Portfolio: The Core Curriculum of a Core Course" (Catherine C. Schiffer). Most papers contain references. (MES)

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ED 457 824

EDUCATIONAL COMPUTING COURSE

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The educational computing course takes many shapes and forms in the different colleges and universities around the United States and the world, but its basic purpose is universal - prepare the teacher to effectively use and integrate technology in the classroom. This purpose now has more of a structure being imposed upon it with the introduction of the National Educational Technology Standards (NETS) (http://cnets.iste.org) that encourage learning opportunities that will produce technology-capable students. In order for this to happen, the teachers must be prepared. In the National Educational Technology Standards for Teachers (NETS-T) the teacher is called the key individual and teacher preparation is called critical. This document goes on to say, "Being prepared to use technology and knowing how that technology can support student learning must become integral skills in every teacher's professional repertoire. Schools and classrooms, both real and virtual, must have teachers who are equipped with technology resources and skills and who can effectively teach the necessary subject matter content while incorporating technology concepts and skills." All of this preparation does not occur in the educational computing course alone, but it is an important piece of the total process.

The papers for this year reflect these changes, some more than others and some in very different ways. One common strategy for preparing the teacher was a much more extensive use of the World Wide Web. The paper by Bump describes the use of WebQuests with all the instruction presented within them. Murray advocates the use of constructivist, web-based projects for the pre-service teachers that help the teachers think about how they learn as they construct their knowledge and their web pages throughout the semester. Pan presents a working model based on a three-level Delta learning theory that includes self-defined goals, hands-on computer experiences, real-world projects and collaboration.

Another strategy for preparing the teacher was changing the structure of the educational computing course. Chen describes the efforts by her college to change the course from a one-hour to a three-hour course that would conform to the new standards and frameworks. Bump proposes a flexible structure for the course so that the inexperienced students would receive more in-class help and personal interaction than the experienced users who were quite comfortable with more online activities. Another part of the flexibility would be some class days for group work and some for individual work time, if needed. Byrum details varying ways to structure the classes within the course to work with the diversity of skill levels in the students. He includes both individual, as well as group, strategies.

The last strategy for preparing the teacher was apparent in many of the papers. This was the need to make a concerted effort to align the objectives of the classes to the national standards and to integrate technology in all the teacher preparation classes. Nonis discusses her college's efforts to change the learning experienced by their pre-service teachers. She says that teacher education students have a better chance to achieve the NETS if effective uses of technology are implemented and expected to be demonstrated throughout all phases of a teacher education program. Espinoza highlights the experiences of three faculty members as they integrate the standards and the technology-rich activities into the teacher preparation sequence.

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Using a Flexible Format to Create a Constructivist Learning Environment in the Educational Computing Course

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Abstract: This paper describes the restructuring of the Educational Computing Course CUIN 6320 Technology in the Classroom, a graduate class at the University of Houston. The purpose of the restructuring was to model to the students appropriate, constructivist teaching methods and activities used in the integration of technology for instructional purposes. By experiencing a constructivist approach, the students were able to make their own connections between technology and its use in the classroom and reflectively evaluate their progress and growth. It is hoped, since there was much growth and improvement in their knowledge of technology and its applications, that they will use these strategies and activities in their own classrooms.

Introduction

How do you teach a teacher to teach differently? How can you get students totally involved with their own learning? How do you introduce the new technology standards to pre-service teachers? The answer to all three questions is simple – model it for them. The Educational Computing Class was restructured so that teachers and pre-service teachers could participate in a constructivist learning environment. The class was set up with a flexible format that had four features: 1. WebQuests to introduce new concepts and topics and provide practice with several technologies, 2. Collaborative work, 3. Web page creation by each individual student as a means for turning in assignments and learning to upload files, and 4. Discussion lists to discuss topics and readings and respond to class members' responses.

The Need to Restructure

The International Society for Technology in Education (ISTE) in the new National Educational Technology Standards for Teachers (NETS-T) stresses that teaching must be different. "Today's classroom teachers must be prepared to provide technology-supported learning opportunities for their students. Being prepared to use technology and knowing how that technology can support student learning must become integral skills in every teacher's professional repertoire" (ISTE, 2000b, p. 2). Over the last ten years the demands on what teachers should know and what skills they should possess have changed dramatically. It is no longer what they know and what they can do technically – it is what they can apply and integrate into their teaching practices, as well as a complete change in how they teach. If teachers are trained in the traditional, lecture style with the professor dispensing all the knowledge, then it is more likely that they will continue to teach this way. But if the professor will model for them a collaborative, constructivist, interactive environment, then teachers will begin to see the exciting possibilities that exist for them and their students. March (1999) says, "... don't look for the online equivalent of your textbook or handouts (though they may exist), look for the sparks that create insights, the contrasts that promote problem-solving, the bells and whistles that motivate, and the passion that inspires". This change needs to be modeled so that the teachers can experience and understand what will be expected of them as they enter the teaching field.

The Major Components of the Restructured Class

WebQuests

"A WebQuest is an inquiry-oriented activity in which most or all of the information used by learners is drawn from the Web. WebQuests are designed to use learners' time well, to focus on using information rather than looking for it, and to support learners' thinking at the levels of analysis, synthesis and evaluation. The model was developed in early 1995 at San Diego State University by Bernie Dodge with Tom March, and was outlined then in Some Thoughts About WebQuests" (Dodge and March 1995) (http://edweb.sdsu.edu/webquest/overview.htm). WebQuests are designed to utilize the student's time efficiently and to provide a clear purpose for the activity. In order to achieve both clarity and efficiency, WebQuests should include an "introduction that sets the stage and provides some background information, a task that is doable and interesting, a set of information sources needed to complete the task", resources that point to information on the World Wide Web, a "description of the process the learners should go through in accomplishing the task, the process broken out into clearly described steps, and a conclusion that brings closure to the quest, reminds the learners about what they've learned, and perhaps encourages them to extend the experience into other domains."

In the Educational Computing Class, five WebQuests were developed and used throughout the semester to introduce new topics and technologies. Students were able to work through the WebQuests at their own pace and with as much time as was needed. All the WebQuests were online (http://www.geocities.com/cuin6320/) and could be accessed at anytime and from anywhere. Any supplemental material was also available online and could be printed.

These WebQuests introduced an overall topic to the students and the assigned task involved the use of a selection of technologies that would best accomplish the task. In WebQuest 1 the students worked with e-mail and discussion lists since these would be critical for communication throughout the semester. WebQuest 2 introduced the efficient use of the web in both teaching and learning. WebQuest 3 illustrated the use of graphic elements and organizers and the importance of their use in the classroom. In WebQuest 4 the students actually worked through an ISTE learning activity from the new National Educational Technology Standards for Students (NET-S) – Connecting Curriculum and Technology (ISTE 2000a) that explored the practical use of spreadsheets and presentation tools. WebQuest 5 introduced primary sources on the web and combined them with desktop publishing.

An important part of any online work is the evaluation of that work and all its components. The students participated in a "WebQuest about WebQuests" (Dodge 2000) (http://edweb.sdsu.edu/webquest/materials.htm) that helped them to see the differences in the quality (or lack of quality) in several WebQuests that were already online. These WebQuests were on several different grade levels, so each group could evaluate WebQuests that would be appropriate for their particular grade level. After WebQuests 1 and 2, the students evaluated the professor-made WebQuests with the evaluation form created by Dodge (1998) (http://edweb.sdsu.edu/webquest/webquestrubric.html). The students were told that their WebQuest, which they would create with their group, would be evaluated with this same form. Hopefully, being familiar with the evaluation form and actually having to apply it would help the students understand the necessary components of any WebQuest and would help them use this knowledge as they developed their own WebQuests.

Collaborative Work

Students worked in groups as they completed the WebQuests. By doing this, they had a support system to help them and to be another resource besides the teacher. The group also provided help that the teacher might not be able to provide because of differences in learning styles, time conflicts, etc. Each of the five WebQuests included a collaborative piece so that the students could get an idea of how valuable collaborative work could be in their own classrooms one day.

As the semester progressed, the groups met during some of the class periods to begin to develop a group WebQuest. These WebQuests included all the above pieces and students were free to structure their group tasks as necessary. For example, some groups divided the tasks by job descriptions, such as resource gatherer, web page designer, editor, etc, while other groups divided the tasks by the pieces of the WebQuest

itself, such as introduction, task, process, resources, and assessment. Near the end of the semester, the groups exchanged URL's, worked through another group's WebQuest and then used the evaluation form to critique their WebQuest. The professor did the same so that the groups would receive multiple and hopefully very useful feedback. The final class day was used to present the updated WebQuests and to provide their URL's.

Online Interaction and Manipulation

Another aspect of the flexible format was the way that students turned in their work that was due. Instead of them having to hand in a disk or a printout, the students would upload their assignments to their own webspace. This webspace was created and maintained by each student and gave them practice with another form of computer-mediated communication. By creating their own website the students experienced many of the possibilities they could offer in their own classroom and in their own students' learning experiences.

Computer-Mediated Communication

The last aspect of the flexible format was the use of computer-mediated communication. One such communication method was use of the discussion list (hypergroup) to discuss topics and readings and respond to class members' responses (http://www.coe.uh.edu/hypergroups/courses/). Every other week there were 2 questions posted on the list to which the students had to respond thoughtfully. Each student also had to read fellow students' responses and then respond to one classmate for each question. Students liked the flexibility of the time involved with the hypergroup since they could read the assigned readings at a convenient time for them and then respond to class members at a different time. If they preferred, both could be done at the same time – post their response to the question and also reply to a fellow class member's response.

Another communication method was the use of e-mail. It was mandatory that students set up an e-mail account and actually use it throughout the entire semester in order to interact with group members and the professor. In prior semesters, the requirement of the use of e-mail was limited since most students were very happy to use e-mail in most of their interactions and no more encouragement was needed from the teacher. But each semester there was always a handful of students who resisted e-mail and were able to complete the course without a thorough, personal knowledge of e-mail's use and advantages.

The Results of the Restructuring

At the beginning of the semester, students evaluated their computer use and knowledge of technology integration using the instrument developed by ISTE, ISTE Recommended Foundations in Technology for All Teachers (http://www.coe.uh.edu/~wren/cuin6320/ISTEself.doc). This instrument has 18 areas in which the students rate themselves with a scale of 0 to 3. If they have never *heard of* the application, they give themselves a zero. If they are *aware of* it, they receive a 1. If they *use* the application, they get a 2 and if they could *integrate* the application into instructional practices, they receive a 3. With the highest score possible being a 54, the beginning scores ranged from 5 to 47. At the end of the semester, the students re-evaluated themselves using the same instrument. On the average, students gained 22 points with the lowest-scoring students making the most significant improvements. A reflective essay, written by each of the students and posted on their personal website, described their growth and experiences throughout the semester.

Here are a few excerpts from their reflective essays: "I discovered that there are many possibilities for the use of basic productivity software to enhance instruction in new and creative ways. I was constantly exposed to valuable resources and encouraged to share my discoveries in the context of classroom activities. From developing a website to creating a PowerPoint presentation to collaborating with others on the creation of a WebQuest, I continually developed skills and applied concepts." "The course has opened my eyes to the possibility of teaching technology skills within the context of real-world problems. Students will benefit from my experience as they learn the skills that I have recently learned and as they strengthen the connections of the skills learned in class with the world outside the classroom. This is timely because I had previously been

teaching these skills in isolation and I was looking for strategies to 'break the mold'." "I was continually challenged to think critically about the use of technology in the classroom and to apply the principles of instruction to the acquisition of technology-related skills." "When we began to create the web-based lesson, I had my first opportunity to see how I could use my newfound ability to create web pages for instructional purposes. While doing this, everything came together...the different aspects of using technology in the classroom that had been covered in previous WebQuests and the whole idea of the instructional power of WebQuests." "I have developed a WebQuest that two of my fellow teachers will actually be using next semester!"

The students also wrote a paper about their group experience and their own contributions to the group WebQuest. All of the papers in each group were compared and a part of the students' grades were based upon their ability to work with their group. It was very interesting to see the differences in what the students perceived about their own contributions as compared to how their group members saw their contribution. In most groups the different perspectives corroborated the others, but in a few cases it was very easy to tell who had slacked off in the group work and participation.

Here are a few of the students' comments about working with their group: "There were no problems with our group's ability to engage in the task, work cooperatively, or with the group's dynamics. Our group was comprised of a very diverse collection of individuals with a range of academic skills. Our diversity helped to make our interactions rich, although there were times that we did have some difficulty in reaching consensus on how to proceed. The group's members were mature enough to overcome individual differences in order to produce desirable results. I truly enjoyed working with this group of individuals and I feel fortunate to have been a part of such a dynamic and intelligent group." "One of our group members was going to drop the course. We are the ones who urged her to stay in the course as we needed her help. As a group, we really had to stick together and use each other's individual expertise in order to ensure quality work." "(one student said, in referring to another group member) She was a great asset because she served as a point of reference for me when I felt swamped. She always was encouraging and very helpful when I was lost in the course."

The last result of restructuring that needs to be discussed is the use of the WebQuest in structuring the class periods, as well as the students' intentions to develop and use WebQuests in their own classrooms. Once the students got used to the concept of WebQuests, they were excited about their use and availability online. They enjoyed the variety of activities, as well as the introduction and application of new technologies. But most of all, many of the students could actually see themselves constructing their own knowledge as the semester progressed and developed an ownership of the concepts presented throughout the course. They saw WebQuests as an efficient way to create similar learning experiences for their students. One student observed that the initial time investment by the teacher would be countered by the time saved in class by having all the necessary materials ready for the students to begin working and also to work at their own pace. Another student observed that WebQuests could be revised, after the students completed them, in order to include needed elements, exclude unsuccessful elements and make other changes based upon feedback by the students, thus minimizing preparation time for the next year.

Conclusion

Modeling the use of the four components made a significant difference in the total course and produced the many desirable outcomes illustrated above. Many insights were gained from the students as the professor solicited much feedback and necessary revisions as the semester progressed. Some of the suggestions were incorporated into the present semester while others will be implemented the next semester. Overall, the students were pleased with themselves for their mastery of so many forms of computer-mediated communication and were surprised that they were able to do so many things with technology in an instructional setting. They appreciated the flexibility of the class and the activities, and were glad to be able to construct their own knowledge from this unique experience.

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Technological Diversity: Managing Differing Technology Skills in the Edtech Course

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Abstract: Students are coming to Educational Technology courses with extremely diverse technology skills. This presentation/paper will discuss varying ways to structure classes or instruction to work with these varying groups. The author will detail several of the strategies used in past classes, the results, and other methods the instructor may wish to consider depending on the situation

Introduction

Students as never before are coming to Educational Technology with extremely diverse technology skills. Once, when teaching technology skills, you could assume that all students were starting from the same point. Today, however, you must assume all students will be coming to you with a completely different set of skills. In many of our graduate classes, the students often range from the level of computer novice to the student who works in the Austin high-tech corridor and wishes to become certified to teach. The difficult task for any instructor is to find ways to deal with these differing skills in Educational Technology classes and make the class meaningful to all students regardless of prior skills.

This presentation/paper will discuss varying ways to structure classes or instruction to work with these varying groups. The author will detail several of the strategies used in past classes, the results, and other methods the instructor may wish to consider depending on the situation. This paper/presentation will discuss individual strategies and group strategies.

Individual Strategies

Student as Expert Assistant

One method is using the student with superior skills to assist the instructor in classes, often assisting those persons needing extra help with projects. The expert/assistant also learns through one-to-one interactions how to deliver instruction. Overall, I have had much success with this strategy.
•Advantages: The instructor receives much needed help in large lab classes by letting the expert/assistant answer some of the general questions and to help those struggling to keep up. The assistant feels he/she is playing an important part in the class and tends to stay engaged.
•Disadvantages: Some students tend to resent the fact that the expert/assistant is allowed to help and not required to complete the project.

Student as Teacher

Many advanced students find that they only really know the intricacies of a software program when they are given an opportunity to teach it to the class and see the results. When students begin working on projects the student/teacher comes to a greater realization of the many ways instructions can be interpreted.

•Advantages: Practice in developing instruction for training, a chance to work with learners and a deeper understanding of the software.
•Disadvantages: The instructor must closely monitor the instruction being prepared for quality and be ready to step in when things go wrong or are confusing to students. The instruction process could prove to be overwhelming for those with little or no experience in teaching.

Testing out

Testing out allows for students to show work or display skills that prove the class is not needed. Great care must be taken if this option is made available and documentation should be extensive. A portfolio of technology work can allow the instructor to give credit for past work, such as basic word processing, spreadsheets, etc. Portfolios can be used to demonstrate basic competencies as well as show the integration of technology in lesson planning and curriculum.
•Advantages: Students do not need to attend a class in which they already have extensive skills. Student can go on to next level.
•Disadvantages: Often students can pass the technical portion but have no knowledge of educational application of these skills. Testing and documentation can be tricky to determine in project-based courses.

Independent study

An independent study may often be a last resort for a student with superior skills and needing a real challenge. I feel independent studies should only be used in extreme cases, those in which you are sure the student easily meets all prerequisite skills for passing the normal class.
•Advantages: Customized to meet student's needs can provide a real challenge, and projects may benefit the instructor.
•Disadvantage: Students can not make up for time in class interacting with peers and discussing issues and trends. Hard to determine if the student is lacking knowledge in certain areas.

Group Strategies

Multiple path instruction

Multiple path instruction gives the learners varying paths to follow in completing class work. This approach takes students "as they are" and helps them improve skills. For example, the instructor may set up a beginner, intermediate, and advanced path for students to take in completing the course, each level with its own expectations and rigor.
•Advantages: Students can progress at their own pace on their own skill level and is challenging to all students.
•Disadvantages: Students may be working on different projects and end the course with varying skill levels which tends to lead to confusion. Often students will misplace themselves in the beginner, intermediate, and advanced levels and may need to change to a different level.

Differentiating assignments

Somewhat like multiple-path instruction except that all students are on same level and allowed to pick and choose from topics and skills in which they feel help is needed. The instructor may require that certain projects be mandatory and leave student choice to many minor projects. The instructor also needs to set minimum competencies for all students. One danger is many students often overrate themselves in their competencies and skip projects actually needed.
•Advantages: Students are allowed to pick and choose areas they feel they need help or in which they are weak. Students like the feeling of setting their own goals and projects.
•Disadvantages: Students sometimes choose what they perceive as the easier projects and stick with things they know.

Contextual Experiences: The Revision and Implementation Process of an Information Technology Course for Master Teachers

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This paper explores the revision of curriculum within a technology course; the curriculum implementation and outcomes. In similar vein, it explores my reflections of the process, with suggestions of pertinent issues, recommendations, pitfalls, and successes.

Although technology skills are certainly important for teachers to learn, few graduate programs in the State of Utah prime teachers for these demands. The Master of Education Program at Westminster College, a small liberal arts college in Salt Lake City, is one of the few programs in the state that offers the technology specialization, for teachers at a graduate level. As a student in this program, I realized that the present instructional approach lacked the latest instructional tools and resources that would enable teachers to effectively transfer and apply technology skills to classroom situations. From this beginning emerged my effort in a curricular revision of the Information Technology (IT) course, one of three courses offered and required to obtain the technology specialization. My thought was to focus more on a hands-on approach, recent instructional technology tools and resources available for teachers, and their classroom application.

Rationale

The impact of technology in the classroom is promoting changes in the role of teachers. Teacher's roles have shifted from dispensers of knowledge to one of facilitators of the learning process with the attendant need to know how to integrate technology effectively to improve student learning. "Teachers must take time out from an already full schedule to learn new techniques and then incorporate them into daily activities" (Hale & Kieffer, 1995).

This technology trend is sending a clear and widespread message noticeable among people in the education field; teachers should be proficient computer users. "Teachers, administrators, and parents are finding that using technology requires more than adding Internet access or placing computers in a classroom" (Norum, Grabinger, and Duffield, 1999). However, Cradler, and Bridgforth (1999) said, "Many educational leaders have little understanding of or experience in using and managing advanced technologies." This situation implies the need for better technology programs at all educational levels.

Although technology skills are certainly important for teachers to learn, few graduate programs in the State of Utah prime teachers for these demands. The Master of Education program in which I was enrolled, through its technology specialization, attended to this need, but not to my satisfaction. My plan was to persuade students to integrate technology applications in their own teaching practice. By using a hands-on approach, I planned to model teaching strategies from instruction to construction as described by Cradler and Bridgforth (1999),

> It [Technology] can shift instruction from Teacher didactic to learner-centered and interactive, from fact telling to teacher-student collaboration, from memorization to inquiry and invention, from the accumulation of facts to the transformation of facts, and from the use of standardized tests to relevant portfolio and performance-based assessments (http://www.fwl.org/techpolicy/techreform.html).

This approach held much appeal.

The Curriculum Design Process

As a framework to commence the curriculum revision process, I raised the following questions:

- What subject content and topics do I need to include in the curriculum to support the course's objectives and goals?
- What learning activities do I need to include in the curriculum to support the content and topics?
- What resources or materials do I need to use to support the instruction and learning activities?
- What are the learners' interests and characteristics?

To obtain answers to these questions, I compared the previous curriculum with my personal rationale for the course. Ideas acquired through a literature search, prior teaching with technology encounters, and what I believed to be effective educational practice. In addition, I appraised the content and objectives of other IT courses at the graduate level tendered in the state of Utah. I wanted to ensure the topics I sought to include were suitable and comparative with other IT courses.

The new curriculum was developed using the same learning objectives as the previous course, but included topics to elevate discussions applicable to teaching theory and computer knowledge. In addition changes included a shift in focus to a variety of hands-on activities designed to expose students to the classroom application and uses of the most recent instructional technology tools and resources available for teachers.

As a neophyte in the area of curriculum design, I attempted to grasp a constructivist approach, where "…most knowledge is constructed in an active, effortful way by learners who are engaged in experiences that promote an opportunity for reflection and assimilation/accommodation to existing knowledge" (Smith and Ragan, 1999, p. 15). Furthermore, the new curriculum reflected my understanding of how to put into practice Dewey's belief that the purpose of education is to prepare children to live in the world; stu-dents would opt to utilize the technology tools and resources learned in their own teaching practice.

Method

My mentor professor examined and endorsed the curriculum before implementation. The class convened on thirteen occasions from January to April of 2000. The participants in this inquiry were graduate students seeking the Technology Area of Specialization in their graduate studies at Westminster College. All but one of the students who enrolled in the class had teaching experience in K-12 or post secondary education levels. Students ranged in age from 22-54 years, three men and six women. Their technology experience and skills ranged from emergent to proficient.

In the majority of classes, the professor conducted the reading discussion from the text. As the curriculum designer I sought out and chose this text. I wanted a text that would be able to provide a link from computer knowledge to teaching practice. Following a review of available texts, I chose Computers as Tutors: Solving the Crisis in Education by Frederick Bennett, Ph.D. (1999)The professor also conducted the final project assignment. I conducted the demonstrations and hands-on activities which followed the topics stated in the syllabus for each week. The following table displays the topics and activities comprised in my curriculum proposal week by week.

WEEK	TOPIC	ACTIVITY
1	Course Overview	E-mail, Setting up a computer Lab, Price Computer layout, Grant Sources. Educators resources in Utah UTAP UEN
2	Planning for Media Use and Instruction	Trouble Shooting Computers, Install memory, and video card
3	Creating Non-projected Visual	Practical use of pictures, posters, and other visuals. **Create a non-projected visual
4	Creating Projected Visual and Audio	Use of overhead, slides, digital images, filmstrips, sound, and other visual. **Create a projected visual.
5	Integrating Computers into the Curriculum	Uses of the Internet in the classroom. Search and **create activities and lesson plans using Filamentality tool
6	Multimedia Projects and Presentation	Corel Presentations and Power Point. **Create a Presentation
7	Computers Networks	WAN, LAN, Basic network set-up
8	EDNET	Distance Learning Education.
9	Distance Learning Education	Search the Web. Online courses **Create a Virtual Tour
10	Working with Images	Graphics, Editing, Animation using Fireworks.
11	Web Page Editors	Introduction to Composer and Dreamweaver
12	Online Resume, Portfolio	Show models. Saving on CD
13	Course Summary	Final Presentations. Choose one of the tools learned and create a lesson. Or use WebCT to put this course online (final project is negotiable).

****mini-projects**

As the course unfolded, students were encouraged to submit weekly comments or reflections for each topic. Additionally, I kept a journal of personal insights from my teaching experience. The professor and I met regularly to discuss student progress, curriculum adaptation strategies, possibilities, and concerns. At completion of the course students shared their comments about the course.

Reflections

The following are brief transcripts of sample journal notes that highlight the progress of the course and my thoughts as curriculum designer.

Week 1: Course Overview

The class did not go as well as I had hoped. Soon after I began to teach, I had more topics to cover than time. I started to rush through the material. I panicked, looking at the clock, and suddenly nothing was working for me. When I tried to explain one of the options for the final project, developing this course online using WebCT, it didn't succeed the way I had planned. "I am not very familiar with the product, but I practiced before class and created a small course, however, in class it did not work! I could not login and I looked, and felt, foolish." In the middle of all the commotion, I forgot to mention the second option for the final project [select one of the tools learned in class to create a lesson]. Even as I near completion of the class instruction, the anguish of that moment is still with me. I decided, "Next time I will try not to cover so much material." However, I was confused about how to do this. The syllabus was set, so how could I make profound changes this early?

Week 2: Planning for Media use and Instruction

A technician from the information technology department at Westminster came to pull a computer apart to show how they work. Students' feedback suggested that the majority of them appreciated learning about the parts and functions of the computers. One said, "I enjoyed the hands-on approach. It helped me by actually seeing the computers and the slots and how they went together." Unfortunately, the technician did not bring enough computers to allow all the

students to use a hands-on approach and monkey around in the guts of the computers. This was a major drawback. Overall, I am not sure what we really gained with this demonstration, other than a general overview of the computer parts. Can the students use this application to actually troubleshoot their classroom computers?

Week 5: Integrating Computers into the Curriculum

One student conveyed, "I think we are extremely involved and so concerned about defining what we are going to do for our final project, that we are distracted from other activities [Integrating Curriculum demonstration]." Students sent a consistent message, however, that while the primary concern of an IT course is to learn educational tools for integration, the time needed to prepare each project and assignment brings stress and frustration.

Throughout the curriculum revision process, it never occurred to me that the intensive amount of topics would provide an avenue for students to disengage from the topics and lose focus on other projects due to the lack of time.

Week 8: EDNET

Today we delivered the class via EDNET, which is the Utah Education Network's interactive system that electronically brings a teacher from one classroom to another. To me this was the biggest event of all because the students had the opportunity to participate in a real life distance learning experience. In education, many courses, degrees, and programs are delivered at a distance. Perhaps ten, fifteen, or twenty years from now, the majority of instruction will by conducted from an EDNET site or another distance learning medium. To facilitate this activity, I encountered many hours of preparation, including training on the system. In addition, some technical difficulties occurred during the event, but that did not diminish the experience.

Although I am in favor of using this type of system as an alternative medium of instruction, it can be a disadvantage. Perhaps it is just a matter of tweaking the way of teaching. The disadvantage comes from the boundaries set by the camera and TV screen. While delivering the instruction, "I felt tight: I could not move, use my hands, or show excitement." My professor could not restrain himself from looking at the monitor to catch a glimpse of the class. The students also felt intimidated by the camera and the microphones. However, the class setting created a meaningful environment that prepared the professor and I to model the use of technology and its practices in a real situation. One student said, "Although I am not entirely sold on EDNET, the chance to participate and learn about it was great!" What does she means by saying, "entirely sold"? Did she mean that distance learning is not effective for teaching and learning? Did the other students feel the same way? What did we gain today?

Week 11: Web Page Editor

I was absent for this class and the professor was going to cover the topic. However, the whole class decided to spend the time to work on the final project. According to the professor, the class was thankful. I do not know how to express my feelings when I found out what happened. As a developer of the curriculum, I would have preferred to follow the plan. Does this make me a behaviorist? On the other hand, as an instructor, I am sure I would have made an adaptation to meet the students' needs allowing them to work on the final project, instead. Does this make me a constructivist? I know that in my personal practice I tend to be flexible and like to negotiate learning and instruction with my students. As an instructor or developer, do I need to stand firm on one or the other approach? Can I mix both: behaviorist and constructivist? Perhaps I need to examine both approaches more closely.

Outcomes

At first, what I tried to do while revising and implementing the Information Technology curriculum was to expose students to the most recent instructional technology tools and resources available for teachers; tools that would be effectively use in a classroom situation. When I asked a student to give me suggestions for a future IT course, the response was, "If the purpose is to offer lots of information about technology, then probably none…[but] I would like the opportunity to become more proficient in some of it [technology tools]. I will have to do that [practice] on my own." Considering this comment and many other issues that arose through the implementation of this curriculum, it is apparent to me that the approach I took to expose the students to a —wide variety—of resources was not effective for some.

This was not an easy personal journey. I began confident in my abilities to envision what an effective Information Technology course should be. I was at time shaken by peers' criticisms and by my professor's concerns

about the plethora of topics each week. Many of those emotions are captured through my weekly reflections and questions

As a novice curriculum designer, I emerge from this challenging situation with an understanding that curriculum development means much more than creating a syllabus of neat ideas. I agree with Kemp, Morrison, and Ross (1996) when they said, "The design process includes the activities of analysis, strategy development, evaluation, and revision" (p.11). I have learned this first-hand.

Recommendations

From my experience the fledgling curriculum designer would be wise to consider the following recommendations before beginning the design process:

- Plan each step of the curriculum development with special consideration on the time entailed to accomplish each assignment or task.
- Ensure that all the technology components work appropriately before the launch of the course.
- Be prepared to absorb great quantities of frustrations before and during the implementation of the curriculum.
- Use outside resources when needed.
- Prepare assignments, projects, objectives, and rubrics beforehand. Participants need to have specific guidelines.
- Carefully revise references, books, and other resources used in the class.
  Do not limit the revision to the content, rather examine the validity of the document to avoid unwanted controversies.
- Provide handout material and visuals to reach each individual.
- Allow more computer time to work on projects and assignments.
- Teach fewer topics to allow more in-depth exploration and technology skills development.
- Combine related topics or assignments (e.g. non-projected and projected projects)
- Do not spend too much time on a subject if the students are comfortable with the topic.
- Teach applications that reinforce basic computer skills early in the course (e.g. graphics) to allow students to build their knowledge according to the difficulty of the concept.
- Spend more time on technology integration strategies and applications.
- Consider the possibilities of working in small groups rather than a large group. This will allow each student to become more familiar with different technology applications.
- Be prepared to make adaptations to the topics and activities as the course develops.
- Be available when the students need help.
- Make each activity as close to real world context as possible.
  When choosing the topics and assignments for a course, ask yourself the following questions: How will these topics fit into the scope of the program? What technology skills will the students need to make sense of the topics sufficiently to ensure transfer to their practices?
- Above all, be flexible.

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Comparison of Face-to-Face, Semi-Online, and Fully Online Approaches for Introduction to Educational Technology Courses for Educators ___

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Abstract: An important experience for educators is learning to use computer technology for teaching and learning. In Florida, a course for undergraduates and a graduate class offer that experience. The courses topics include educational hardware, software, multimedia, Internet, and ethical and legal issues. Both courses share primary goals: building technology skills, and helping students to become integrators of technology into teaching. This year, six simultaneous sections of the courses were offered using a range of approaches. Two sections were taught fully face-to-face. Three sections were taught with students meeting in person for 50% of the time, and working in a web-based environment half of the time. One section met only online. Surveys of all students were conducted at the beginning and the end of the course, and student performance on class activities and assessments was tracked. Comparisons were made on student attitudes and self-reported technology abilities, as well as course grades.

Reports from businesses, standards documents from ISTE, and educational accreditation policies from NCATE underscore the importance of technology as a teaching and learning tool. Studies indicate that there are new and veteran educators who do not have the skills for using technology in the teaching and learning process (Barron & Roblyer 1993; Market Data Retrieval 1999; Southeast and Islands Regional Technology Consortium, SERVE, Inc. 1998). An important experience for both preservice and inservice educators is learning to use computer technology effectively as a teaching and learning tool. Higher education programs that prepare professional educators address the need for technology experience in several ways. Educational technology courses may be required, or technology may be integrated throughout other required courses.

In Florida's state university system, students in education programs leading to initial teaching certification take a required educational technology course. Undergraduate programs include the sophomore level Introduction to Educational Technology. Graduate programs include Computers in Education. Both courses have twin goals: building student skills as technology users, and providing background for students to become integrators of technology into teaching. The beginning course in educational technology, mandated by the state of Florida in 1996, is critical in the education of preservice teachers because it is the only required technology course. Web sites and conference presentations confirm that there are multiple approaches to teaching this course.

The courses cover the following topics: educational hardware, application software, multimedia, Internet, and ethical and legal issues. Each course is a three-semester hour class. Traditionally the course has been offered fully face-to-face in a classroom. The class has been web-enhanced with online assignments. This year a group of faculty taught the course using a continuum of approaches ranging from fully classroom-based to fully online. The purposes of employing the continuum of approaches was to determine whether there is a balance of classroom and online learning that is most appropriate for the students in the courses. Six simultaneous sections of the courses were offered: two sections were taught fully face-to-face, three sections were taught with students meeting in person for 50% of the time and working in a web-based environment the rest of the time, while one section met only online. Three instructors were involved with the six sections, teaching a total of 115 students.

In order to evaluate the success of the approaches, several measures were used. At the beginning of the Fall 2000 semester, all students in the courses took online surveys. The surveys and survey methods were identical. The surveys captured baseline information about the students regarding their views of their technology experience, attitudes and skills. The survey items are described in the appendix. The surveys were repeated at the end of the semester. During the course, students participated in similar learning experiences to receive course grades. Students also completed university course evaluation forms at the completion of the course.

Using the surveys, course grades, and course evaluations, results were compared to answer the following questions:

- Do students who opt for an online course initially differ from those who choose a classroom course in their skills and attitudes toward instructional technology?
- Do graduate students initially differ from undergraduate students course in their skills and attitudes toward instructional technology?
- Do students experience a positive change in their skills and attitudes toward instructional technology as a result of participation in a course, and if so, does that change relate to the teaching approach of the course?
- Are changes in skills and attitudes toward instructional technology related to the student's graduate or undergraduate standing?
- Is student class performance related to the teaching approach of the course?
- Is student course evaluation related to the teaching approach of the course?

The results of the comparisons will be used to determine the most effective teaching approach, and to incorporate that knowledge into planning for future semesters. The survey completed at the beginning of the semester provided a baseline of student status, and a comparison of technology experience and attitudes among classes. At the start of the term, the undergraduate students rated their computer skills and experience at a significantly higher level than the graduates students did (p value of 0.001867). Using the 5-point scale, the undergraduates gave themselves a score of 2.15, averaged over the experience questions for all students in the undergraduate classes. The graduate students rated themselves at 1.75 on average. When comparing the students according to the teaching method, the graduate students who chose to take the fully online course rated their skills at a significantly higher level (2.34) than students in both the fully classroom-based (1.67), and hybrid classes (1.63) (p value 0.019356). The skill ratings of undergraduate students in the fully classroom-based classes (2.32) did not differ significantly from those in the hybrid classes (2.06) (p value 0.152215).

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Appendix of Survey Questions

The first set of questions asks students to choose from among a set of options to: Identify your course instructor, your gender, your class standing at the university, your age range, and whether you are taking this class as a requirement. The set of questions related to computer experience ask students to rate their level of experience on a scale from 1 indicating no experience to 5 indicating extensive experience. Students rate their experience using operating systems (Unix, Linux, Windows, Macintosh OS), web publishing software, presentation software, digital video, word processing, web browsing, email, animation, search engines, databases, spreadsheets, digital audio, digital graphics, gradebook software, FTP. The set of questions related to computer attitudes ask students to rate their level of agreement with statements on a scale from strongly agree to strongly disagree. The questions relate to students' comfort or anxiety with computer applications, and feelings about the importance and usefulness of computers. Questions ask about student's confidence with email, word processing, and databases.

Redesigning an Educational Computing Course to Meet New National and State Technology Initiatives

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Abstract: The Department of Urban Education (UE) at University of Houston Downtown first began in the fall semester of 1995. It has just started along the technology trail to learn from other institutions that have already addressed some of the issues and found some answers. The shared goal of the faculty in the department is to offer an educational computing course that falls on the end of "teaching with technology across the curriculum". The one credit hour educational computing class CS1105 is in the process of being redesigned by the UE faculty as a 3 credit hours class ETC 3301. The brand new ETC 3301 is proposed to open to all entering pre-service teachers starting spring 2001. Texas Education Agency, State Board for Educator Certification, and several other governing institutes of teacher education programs in Texas are raising standards for computer literacy for new teachers. It was suggested to all computer literacy courses to conform to the current versions of the national and state frameworks and guidelines. On the survey, the students were asked to evaluate their skill levels on using programs such as spreadsheet, database, and philosophy of using technology. This paper will also analyze results from students' self-reports completed on the first day of class for three semesters. The students' input will be implemented into the redesign of the CS1105 to ETC 3301. The paper will discuss the processes of redesigning the educational computing course to meet new state technology application initiatives.

Introduction

In the state of Texas, Texas Education Agency, State Board for Educator Certification (SBEC), and several other governing institutes of teacher education programs in Texas are raising standards for computer literacy for new teachers. For example, it is projected that in 2002-3, the on-line version of the ExCET, the state mandated teacher certification exam, will be piloted, and technology related questions will be embedded across the question sets in the professional development exams for all levels. To meet new state technology application standards, the paper plans to discuss the processes of redesigning the educational computing course ETC3301 at the teacher preparation program at University of Houston Downtown to better prepare the future teachers for the higher expectation on using technology in classrooms. Educational technology in preservice and in-service teacher training organization is a new field that has attracted researchers attention during the last decade of the 20th century. The research findings of the proposed research will also contribute to the study of educational technology and teacher education worldwide.

The Need to Change

The Department of Urban Education (UE) at UHD first began in the fall semester of 1995. It has just started along the technology trail to learn from other institutions that have already addressed some of the issues and found some answers. The teacher education programs across the country may be placed along a continuum in their integration of technology: on one end is teaching about technology while on the other end is teaching with technology across the curriculum (Office of Technology Assessment, 1995). The shared goal of the faculty in the department is to offer an educational computing course that falls on the end of "teaching with technology across the curriculum".

The one credit hour educational computing class CS1105 is in the process of being redesigned by the UE faculty as a 3 credit hours class ETC 3301. The brand new ETC 3301 is proposed to open to all entering pre-service teachers starting Spring 2001. Following several governing agencies' suggestions, the new educational computing

class ETC 3301 plans to conform to the most current versions of the following national and state frameworks and guidelines for technology education for beginning teachers:

- NCATE 2000 (http://www.ncate.org/2000/2000stds.pdf)
- StaR CHART from the CEO Forum (http://www.ceoforum.org/)
- SBEC standard (http://www.sbec.state.tx.us/certstand/certstand.htm)
- ISTE NETS*T (National Education Technology Standards for Teachers, ISTE) (http://www.iste.org/standards/index.html)

The purpose of the redesign of ETC 3301 is three-fold: (1) the new course will conform to the national and state frameworks and guidelines for technology education for beginning teachers; (2) to help the students have a better chance of passing the state mandated certification exam ExCET, which, as stated in previous section, in the near future is going to embed more technology related questions across the question sets in the professional development exams for all levels; (3) to help our students to become better teachers for the 21st century.

The Process

Understanding Students' backgrounds

Research has shown that a pre-service teacher's initial attitude toward technology may impact their future use of educational technology in the classroom (Rodriguez, 1996). Instructors should be knowledgeable of the factors that could cause students to exhibit behavioral characteristics.

In order to gain initial knowledge of students' background, since 1999 when first started teaching the computer literacy course, the author has requested students taking CS1105, the predecessor of ETC 3301, to fill out a paper-and-pencil questionnaire when the students take their first professional development course, asking them to answer computer/technology related questions. The author has analyzed results from students' self-reports completed on the first day of class for three semesters. The questionnaire is then followed by e-mail-based homework answering questions such as their teaching strategy, their teaching philosophy, their position in integrating technology into teaching, etc.

On the survey given out during the first class of the computer literacy course, 94% of the population indicated that they were at least fairly competent with word processing and 76% of the population indicated that they were at least fairly competent with Internet. All students agreed that integrating technology into instruction is very important. Yet only 12% of the population indicated that they were at least fairly competent with spreadsheet, 4% of the population indicated that they were at least fairly competent with database, and 15% of the population indicated that they were at least fairly familiar with educational software. The results suggested that database, spreadsheet, and educational software are the areas that need more enrichment activities.

Many researches have been done and many instruments have been developed to investigate prospective teachers' attitudes toward computers in relation to gender, age and academic major (Collis, 1996; Hadley & Sheingold, 1993). However, this is the first time this type of research has been done on the students seeking teaching certification at UHD. It was hoped that the students' inputs could be implemented into the redesign of the CS1105 to ETC 3301.

. After teaching CS 1105 for many semesters, the initial impressions of the author were: the students are positive in their attitudes toward using computers; database is one of the weakest areas for the students; many students stated that they are not familiar with Macintosh computers although Macintosh computers have been used widely in K-12 schools; more than half of the students have access to computers at home, office, or the classrooms where they are doing their student teaching.

The variables of the research include: familiarity with Windows computers, familiarity with Macintosh computers, familiarity with word processing, data bases, spread sheet, e-mail, World Wide Web, CD-Rom technology, educational software packages, and anxiety level using technology, computer ownership, access to computer from office/classroom, access to the Internet, philosophy of using technology to enhance learning, opinion about using technology to facilitate teaching, opinion about computers being necessary educational tools, etc.

The author has collected information from approximately 200 subjects from the student pools of Spring 1999, Summer 1999, and Fall 1999. The returned responses are in the formats of paper-based questionnaire and Microsoft Exchange e-mails, and Microsoft Word document. Under the support of the Organized Research Committee fund at UHD, the author has conducted a project "Instructional Implications of UHD Teacher Education Students' Basic Skills, Attitudes, and Anxiety Towards Using Computer Technology" in Fall 2000. The author has conduct analysis to find the reliability coefficients, multiple regression, etc of the variables. This project has reported

findings on the archived data of a survey of students in the professional computer literacy course for educators and has related some implications these findings have for teacher educators. The findings of the proposed research will help to identify the weakness of students' computer skills, attitudes, and the anxiety levels of the students in the UHD teacher education program. Based on the findings of the research on students' computer background, special redesigning can therefore be made for the whole class or a special group of students.

Maintaining Student Motivation

To further incorporate the motivational design into lesson planning, a search for a better instrument to assess course motivation has been conducted. The author is considering using John Keller Course Interest Survey, Personal Background Information, and the Instructional Materials Motivation Survey (IMMS). In his online article "How to Integrate Learner Motivation Planning into Lesson Planning: The ARCS Model Approach", John Keller of Florida State University discusses applying the ARCS Model to meet the challenge of stimulating and sustaining learner motivation and the difficulty of finding reliable and valid methods for motivating learners (http://www.netg.com/research/kellerwp.htm). According to Keller, the ARCS model of motivation (Keller, 1999a) provides guidance for analyzing the motivational characteristics of a group of learners and designing motivational strategies based on this analysis. The ARCS model is based on a synthesis of motivational concepts and characteristics into the four categories of attention (A), relevance (R), confidence (C), and satisfaction (S) (Keller, 1999b). These four categories represent sets of conditions that are necessary for a person to be fully motivated (http://www.netg.com/research/kellerwp.htm). If the learners are attentive, interested in the content, and moderately challenged, then they will be motivated to learn. But during the course planning process and when the course is ongoing, the satisfaction criteria will also be constantly monitored to sustain this motivation.

Alignment Analysis

Detailed analysis has been conducted to ensure complete alignment of the curriculum with the standards. The author who is scheduled to teach ETC 3301 has downloaded the national and state frameworks and guidelines from the Internet, formatted them into rubrics, and undergone an item-by-item analysis of the standards with the planned classroom activities. Take the curriculum alignment with the SBEC standard for Technology Application for example, there are eleven Standards in total which provide the general guidelines. Within each Standard there are a section for "Teacher Knowledge: What Teachers Know and Understand" and a section for "Application: What Teachers Can Do" which provide detailed interpretations of the specific Standard.

There are three columns on the rubric used as a template for the faculty in the Department: (1) detailed description of "Teacher Knowledge: What Teachers Know and Understand" and "Application: What Teachers Can Do", followed by (2) textbook chapters that correlate with the knowledge and application, and (3) finally the activities that can be conducted during class. If unmet standards were identified, either original activity could be modified or new activities could be added around the unmet standards. The alignment analysis has been turned in for the departmental curriculum alignment committee to review. A copy of the alignment analysis is kept in an open area for the faculty member to add more ideas and facilitate information sharing with each other.

Textbook Selection

In addition, as the second step, from a pool of 5 pre-selected potential textbooks on the topic, one new textbook has been singled out for adoption for Spring 2000 by a departmental curriculum committee made up of faculty members teaching a variety of subjects within the Department, including but not limited to science education, bilingual education, language arts and social studies.

Conclusion

In the initial planning stage, the topics chosen are as follows: Operating System, Desktop publishing, Database, Spreadsheet, E-mail, Web search, Multimedia/hypermedia, and Software evaluation. Depending on individual needs, students will be allowed to pick up a few subjects from the above list and complete small projects assigned by the instructors. The students will also have the flexibility to do work for different subject content and grade levels. Throughout the whole semester, students are required to conduct at least two mini-lessons or micro-teaching which demonstrate their proficiency in integrating technology into curriculum. Mini-lessons or micro-teaching also offer a chance for students to observe and learn from each other. In general, student-centered teaching and learning approach will be encouraged.

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Technology -- Stand Alone or Integrated?

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Abstract: What technology should be included in teacher preparation programs, and where should it be taught and/or practiced? As states (and other entities) establish technology standards to be addressed in teacher education, programs are looking for the best way to integrate these standards into existing (or new) courses. Three faculty members share their recent experiences, from their examination of the Texas Technology Applications Standards, to a determination of where each is addressed in the professional development sequence of courses as well as in the technology courses, to the development of activities to assure that all students address all of the proficiencies that are included in the standards. Included are the standards, the procedures used to determine and/or add needed technologies, and student activities.

Technology and Teacher Education -- two items that are becoming increasingly intertwined. Much money and talk have been devoted to the duo, with a growing awareness that just putting the technology out in the schools is not enough. Teachers must be trained to use that technology to enhance student learning, and a natural place to start is with preservice teacher preparation programs. This comes at a time when universities are evaluating and expanding or otherwise enhancing technologies (and related infrastructures), some of which are to be used for alternate methods of course delivery (Internet based, videoconferencing, etc.) by faculty members who may or may not have had any training in such techniques. Even 'traditional' classes are changing, as instructors (and/or their students) expect to have computers, projectors, and Internet connections in the classroom for use as an integral part of instruction and presentations. Teacher education faculty are hearing how important it is to learn the technology, to model its use for their students (future teachers), and to help those students learn to integrate it into their (the students') teaching fields. So how did we get to this point, and how are we addressing the issue?

Technology and Teacher Education

Teacher education programs have been charged with preparing teachers for the classrooms of today and tomorrow. Many of these k-12 classrooms are changing, and some have changed drastically from the days when the current teacher education faculty were students in elementary and secondary schools. Some of the students in these programs, especially the growing numbers of non-traditional students entering the teaching field, may also find that the classrooms in which they will teach are not like the ones in which they received their education. The challenge is to prepare both faculty and students to work with students in these new environments.

One of the most visible changes in the classroom and school of today is the presence of computers and related technologies. Although technology has come to be recognized as an essential component of education, much

of that recognition in both k-12 and higher education has been demonstrated by the acquisition of computer hardware and software. This technology was often under-used because the teachers either did not have the appropriate software to use with their students, did not have access to enough computers for all class members, or just didn't have the time. A basic reason, though, was a lack of knowledge about how to use the computers and what those computers could help them and their students. Teachers needed to learn how to use the computers, but they also needed to learn to integrate computers and computer-related technologies into classroom activities and to develop a vision of the role of technology in education.

Technology Standards and Teacher Education

The importance of technology in education, and the need to prepare teachers to use it as an educational tool, is highlighted by the prominence of technology goals and standards for education and educators. At the national level, four goals (Educational Technology Goals, 2000) have provided a general framework addressing technology in the classroom in terms of accessibility, connectivity, integration, and teacher preparation. More detailed are the ISTE/NCATE National Standards for Technology in Teacher Preparation (ISTE, 1998), which have been used by many institutions to guide the integration of technology into their teacher education programs. As part of their National Educational Technology Standards (NETS) for Teachers (ISTE, 2000) ISTE has revised and expanded the earlier standards, to accompany the standards that they had developed for students. Many states also have been developing technology standards. Texas has just approved a set of Technology Applications Standards (SBEC, 2000) for which all educators will be accountable – and education programs are currently working on ways to assure their graduates will have the prescribed knowledge and skills to enable them to pass certification exams which will cover these standards. (Although there are eleven standards, only the first five are for all teachers. The others are for teachers of the high school computer science and technology applications courses such as web mastering, desktop publishing, etc.)

While standards suggest *what* skills and knowledge must be acquired, there is still the question of *how* and *where*. And that brings us to the often debated issue of the best way to 'teach' technology in teacher education programs. This on-going debate has two (often opposing) forces – those who believe a separate technology course is essential, and those who consider it better to integrate technology throughout the curriculum. There are advantages and disadvantages to each. The integration approach will require coordination of content in different courses and different disciplines, to assure that all students received appropriate (and required?) technology experiences. On the other hand, a student taking a technology course may not consider using the technology skills and knowledge outside that class. A third option is to combine these two approaches, having students take a technology class, but also having technology integrated throughout the other courses in the teacher education program.

The Dual Approach

At Texas A&M University-Commerce, students in the preservice secondary education program complete introductory education courses and all or most of their out-of-education courses before their final two semesters, when they will have a year-long field experience. The first semester they will be interns, and then during the second, they will be residents – with increasing responsibilities for classroom activities ending with full student-teaching. One of the program goals is that the students use technology in their teaching (and other school-related) activities in a way that enhances student learning. Shortly after we instituted the intern/resident year, we introduced a technology integration course into the final semester, feeling that this would give students an opportunity to apply what they were learning in their university class when they were in their k-12 classrooms. We quickly found, though, that this was not adequate. Currently we use a dual approach, as described below.

Before entering the secondary education program, students must take an introductory computer course (ETEC 224) to provide them with basic computer skills to prepare them for the computer integration course as well as for computer-related activities in their other classes. Then, before their internship and residency semesters, they take ETEC 424 (Integrating Technology into Curriculum). Meanwhile, in their professional development sequence courses, technology experiences are integrated into the various courses. Although originally (as mentioned above) ETEC 424 was taught during the residency semester, it was determined that the students needed these technology skills in place before they began their classroom activities. Now, they acquire and practice skills and knowledge in ETEC 424, and then are expected to use these in their classrooms during semesters after they complete the course.

Key to the integration of technology throughout the program is the involvement of faculty, and we have

used the May, 2000 release of the Texas Technology Applications for all teachers (SBEC, 2000) as a way to find out what technologies are being used what students are expected to know before getting to specific courses, and what training faculty want and need.

Technology Skills

As we began our integration and alignment efforts in terms of technology in all courses, faculty members from the technology classes and the secondary professional development courses each reviewed the Texas Technology Applications Standards and indicated which they addressed in their classes and how. This provided us with a base, from which we could be sure that prerequisite skills were included in the appropriate computer course, and that all of the standards, including the 17 knowledge and the 66 applications statements, were addressed in one or more courses. Then, to get a better idea of what skills students came in with, and what they left with, we interviewed the faculty members who taught the first and last secondary professional development courses that students took. Information from those interviews is presented below, and is followed by a discussion of the technology classes and how the Technology Applications standards fit in with all of this.

The First Semester

The first professional development course students take is SHED 300 – a basic introduction to the teaching profession, which includes a field-based component where students go into the schools for 30-hours. Before taking this course, students must have completed a basic introductory computer course (either ETEC 224 or a similar course in another college). Therefore we looked at this course to see what technology experiences these students had in class, and whether all prerequisite skills were included in ETEC 224. The SHED 300 instructor submitted the following information.

Students entering the teacher education program possess a wide range of computer skills – from computer programmers and repair technicians to the computer challenged. Some students have completed the required educational technology courses, others are simultaneously enrolled in the introductory teacher education preparation course and the educational technology courses, while others are planning on taking the educational technology courses in a future semester. this wide range of knowledge and abilities poses a challenge for the college instructors.

On the first day of class in SHED 300, students are required to submit their Early Field Experience applications to the Certification office by using a newly-developed on-line system. Using this application method within the first week of the semester greatly reduces the time to place students in the schools where they will be observing. It also gives them an initial experience in the use and value of technology.

Other uses of technology in the teacher education program include PowerPoint for class presentations, sending and receiving e-mail, submitting assignments over the Internet using attachments, searching web sites for lesson plans and other teacher topics, downloading TEKS (Texas Essential Knowledge and Skills – curriculum information) and ExCET (Texas certification examinations) information, and word processing programs.

The Last Semester

During the final semester of their certification courses, students are in the schools everyday, but come back to class for seminars several times throughout the semesters. University supervisors visit them in their classrooms each week, observing and conferencing with them. The instructor for the seminars, who also visited some of the students as supervisor, provided the following the technology uses in her classes, and in the students' teaching activities in the schools:

When students come into the second half of student teaching they must know how to use the computer. They do extensive online searches for lesson plans at different sites to improve their lessons; they write journals each week about classroom experiences and send these to me via e-mail; they use WebBoard (posting messages and chatting) as an electronic forum to communicate with each other and their peers; and they practice testing skills online at state and university web sites..

They are expected to integrate technology into their lessons, providing interactive learning activities for their students. For example, one student used the computer to allow students to trace the steps to the Presidency. Students gathered information on the candidates as well as looked at the issues, as they progressed through the sites suggested by their teacher. Immediate vocabulary assistance was available – a student who did not know the

meaning of a word needed only to click on the word for an explanation. Student had fun while gaining information, and various learning levels were addressed.

In another unit a math student created a PowerPoint presentation on Scuba Diving to use with his students. First, though, he had his students create and present to the class their own PowerPoint presentations about famous mathematicians and other math related topics.. This activity helped prepare these students for their instructor's presentation about how to use a profile in scuba diving.

Another math teacher used PowerPoint to show students how to take notes on math theorems. The students would later collect these, make note cards, and have a small math book of their own at the end of the year.

An ongoing use of technology for the residents is posting on WebBoard, where their comments can be read throughout the semester. This is a closed environment, open only to class members, so it is basically their online classroom, where they feel free to discuss issues openly with each other.. At the start of the semester, each student's first posting includes answers to the following::

- Who are you?
- What district are you teaching in?
- What was you first lesson?
- Why do you want to teach?
- Discuss one thing that has surprised you most about teaching.

This helps students get to know each other, and also provides a place where the information may be found later when it is needed. Students also post reflections – over assigned topics or as 'free-writing.' This interaction helps student to overcome the isolation that some of them feel. One teacher said that it gave him a chance to know what his peers do in their classes – since his classroom was on the other side of the school. Away from most of the other classrooms, he felt alone. Students were also asked to share information about what they were doing in their classes, especially examples of how they were using technology. As they posted and read, they began to use each other's ideas, and when they came to the university for seminars they discussed what they had learned from their WebBoard exchanges. They were learning from each other, and it was not restricted to time in class. Technology (WebBoard) was enabling them to have this on-going forum that they could access from anywhere (provided they had Internet access) at anytime.

The Technology Courses

In the secondary teacher preparation program, students major in other areas, and only come to us for their professional development courses. When they come to us as juniors, they have already completed an introductory computer course – this is what some people refer to as 'basic computer literacy.' Course content includes how to operate a computer and to use basic computer applications – and includes all of the skills that students will need to perform the SHED 300 activities, described above. Because of the wide variety of skills possessed by the students, activities are often personalized – to encourage all students to go beyond their comfort level.

Before students enter their internship and residency year, they take ETEC 424, the technology integration course. There, they build upon the skills from their introductory course, with an emphasis on the relationship between learning and technology, and on ways to integrate technology into the curriculum. These are the skills that lead to the classroom activities observed by the instructor during students' resident semester. WebBoard, which was introduced briefly in the previous course, is used more extensively here, and the chat mode is introduced. The classroom/lab environment provides students with the opportunity to share and to learn from each other. Many students take this at the same time that they are taking SHED 300, and the observation hours for the SHED class prove helpful here, too, as they look specifically for technology use in the classroom (which is one of the required SHED observation topics).

The Standards

So how and where do the Texas Technology Applications Standards fit in? The activities listed by the instructors of the first and last SHED classes fall under several of the five standards that are for *all* beginning teachers. Those five basic Technology Applications Standards (SBEC, 2000) are:

Standard I. All teachers use technology-related terms, concepts, data input strategies, and ethical practices to make informed decisions about current technologies and their applications.

Standard II. All teachers identify task requirements, apply search strategies, and use current technology to efficiently acquire, analyze, and evaluate a variety of electronic information.

Standard III. All teachers use task-appropriate tools to synthesize knowledge, create and modify solutions, and evaluate results in a way that supports the work of individuals and groups in problem-solving situations.

Standard IV. All teachers communicate information in different formats and for diverse audiences.

Standard V. All teachers know how to plan, organize, deliver, and evaluate instruction for all students that incorporates the effective use of current technology for teaching and integrating the Technology Applications Texas Essential Knowledge and Skills (TEKS) into the curriculum.

Under each Standard there are 3-5 knowledge statements, and 8-18 applications statements, for a total of 83 proficiencies. The challenge to our program is to provide every student with experiences related to each. Some of the content areas do a good job of integrating technology into their classes, but others do not, so we are addressing all of the standards (and their components) in the ETEC and/or SHED courses. To determine where we stand, a form listing the proficiencies and asking faculty to indicate which they addressed and how they did so was distributed. Input from those forms has been reviewed, and ETEC courses have been modified so that all students will have the skills needed for SHED classroom activities. Examples of the proficiencies and responses, demonstrating the differences between the two technology classes include:

1.3 Select and use software for a defined task according to quality, appropriateness, effectiveness, and efficiency.
ETEC 224: Students will work in groups to evaluate basic categories of computer applications programs (word processor, spreadsheet, database, etc.); and to analyze advantages and disadvantages of each.
ETEC424: Students make software selections based on appropriateness/effectiveness for the task. They choose between word processing, database, presentation, scanning, and spreadsheet software.

2.6 Determine and employ methods to evaluate electronic information for accuracy and validity.
ETEC 224: Provide students with real life problems to research and have them work in groups to: evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of their accumulated information, and to prepare a report of their findings.
ETEC 424: Students learn to evaluate the information they retrieve from the Internet and electronic database for accuracy and validity. They learn basic rules to follow and to use with their students when they are teaching.

3.2 Plan, create, and edit spreadsheet documents using all data types, formulas, functions, and chart information.
ETEC 224: Have students create a budget spreadsheet that would reflect their individual yearly, monthly, and daily real-life expenditures.
ETEC424: Spreadsheet – create a gradebook including intermediate formulas, charting, and data comparison.

4.8 Use telecommunication tools, such as Internet browsers, video conferencing, and distance learning, for publishing learning.
ETEC 424: Students develop a web portfolio that is published on the Internet and also present their PowerPoint presentations via distance learning system on campus.

5.6 Identify and use resources to keep current with technology information.
ETEC224: Discuss as a group the sources of current information on new technology concepts and devices, and have students explore for and show examples to the class.
ETEC424: Students develop a list of resources to use as links on their web portfolio.

5.7 Create project-based learning activities that integrate Technology Applications TEKS into the curriculum and meet the Technology Applications TEKS benchmarks.
ETEC 424: Students locate the discipline-appropriate TEKS on the Internet and incorporate them into their collaborative WebQuest assignment.

The Future

Our initial examination of the standards and how they are addressed in our program, indicates that we are already addressing most of the standards and proficiencies in one way or another. Questions arise about what we need to add, and what we need to reinforce. Of utmost importance is the determination of what benefits students are deriving (and retaining) from these experiences. Classroom observations, as described above provide documentation that some students are taking what they learn and implementing those ideas.

An added bonus resulting from the Technology Applications Standards is that they may have a tendency to help encourage non-technology faculty to learn and then model use of technology in their classes. The more people use computers, the more comfortable they become, and the more comfortable they are, the more they learn, and the more they learn, the more they will undoubtedly want to use computers. The next question will be whether we can eliminate the computer literacy class, because people are coming in with such greater knowledge and skills in the computer arena. With the nature of technology, though, we may want to keep the course and update its content!

Conclusion

Technology is helping us to improve some things we have done in the past, but it is also helping us do things we never dreamed of. The various technology standards at all levels provide guidance for us in the ways that technology can be used to enhance instruction. This is definitely an exciting time to be teaching.

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The Anatomy of an Educational Technology Seminar

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Abstract: In this case study, a group of advanced educational technology students "invent" methods that infuse technology into a dry, research based history course. In the process, the students develop several products, and create educational software for other students to use.

Recent research we have been conducting at the University of Florida suggests that educational technology courses have a high degree of cross-grade similarity from the elementary grades through graduate school. Educational Technology instructors seem to focus on what is *hot* (everyone is making web pages), rather than clarifying a vision of the discipline. One could make the case that the field changes so rapidly that instructors are simply trying to "keep up", or that in times of rapid change practice precedes theory, but most current educational technology programs, including ours, have serious deficiencies.

Our students, for example, have very little knowledge of historical figures in education, and in educational technology. Although our program includes the study of innovation diffusion and change theory, students have an extreme lack of interest in historical change agents. As a response to this state of affairs, I recently decided to offer an Educational Technology seminar to investigate historical figures in education. I intended to make the course a pure research course, and foresaw no need to schedule computer lab time. My students, however, had other ideas. What follows is a description of how a group of self actualized students can integrate technology into a course in meaningful ways, apply collaborative methods, and develop sophisticated, content specific media for a larger learning community.

In the summer of 2000, at the first meeting of my seminar, I distributed a list of seventy-two famous educators, including about 25 contemporary educators to my class of eight students. I gave each student two weeks to write a one-page biography of each educator, meaning that each student would produce 72 pages of biographical information during the first two weeks of class. During the second session, we discussed some of the radical thinkers involved with education, and the passion of their beliefs. After a lively discussion, one student asked, "What are we going to do with all of our research?" Since the students in the seminar were all Masters and doctoral students that had been with me for a few semesters, they were comfortable with computers. "Let's synthesize our individual pages into a biography for each educator and create a book for every member of the class", said one student. Another said "No, let's put it online so other students can study these people." "Let's do both! said another. So they set up committees, divided up the list, and met to synthesize the pages and pages of information they had gathered.

At the next session, a student suggested that we create a database and enter the data about each person into this "Master" file so that we could generate web pages and the book from the same file, thus optimizing our error correction work. Another suggested putting the database online so that the class editors could work on the database from home. Then, someone had an idea. It started with "Hey, you know what would be really neat?" "What if we could make a game, kind of like the Millionaire game, and put it on the web, so that all the students could learn who these people are..." Another student said "Yeah, and people could use the game to study for their quals..."

During the weeks that followed, the students set up an online database for questions, answers, and hints, entered about 150 questions, designed the game (and redesigned it several times), programmed the game, posted it to the web, and continued to work on the other projects they had initiated. The fact that the magnitude of the

project was so great that it would take longer than the seminar lasted didn't seem to matter. They would keep working on it until they finished it.

The class finished some projects before the class ended, others took until October (the seminar lasted until August). Seminar time was filled with discussions, watching videos about history, and making decisions about the products.... hundreds of decisions about every aspect of the game, the databases, the web site for reference - and everyone was involved.

What is the goal of an educational technology class? How do 21st Century learners differ from their predecessors? How is it that educational technology students are often more interested in problem solving than in "how to get an A"?

I have come to believe that educational technology leaders need to have gumption. Once they decide not to give up, they have to become problem solvers. In order to do that they have to be able to make decisions...many, many decisions related to human-computer interaction, instructional design, screen design, and pedagogy. They must realize that a response or solution to a problem may be extremely complex and involve many layers of decision making. They must always have an eye on community - is there a way my work can benefit others - we are smarter and more prolific collectively than we are individually. Somehow, they must develop vision, and must be able to communicate that vision. It is cause for celebration that somehow, often in spite of us, our students seem to be doing these things, and learning these truths.

I couldn't have designed a course that achieved the standards the seminar students set and achieved for themselves, but I believe that as we develop curricula, we must be concerned about more than topics. We must be concerned with developing leaders with vision and decision making ability, with gumption and a sense of community. It seems to be less about learning rules and more about enjoying a good, ill-structured challenge. Can we teach students to have fun being perplexed?

Come play the game: *"So you want to be an Edugator?"*

http://www.coe.ufl.edu/webtech/edugator/edugator.htm

(You'll need a very recent version of Shockwave)

Technology education and integration: A position paper on attitude, perspective and commitment

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Abstract: You cannot get a generation of non-computer-users to integrate classroom technology for children. Instead, enable teachers to BE technology-users and classroom implementation will follow. This author suggests a relational link between (a) teachers' educational expectations, (b) computer educators' notions of how teachers learn computing, (c) what administrators believe teachers need, and (d) teachers' personal commitments to computing. It is suggested that this relationship accounts for the 25 year failure of technology integration.

The full expanded version of this paper is available on-line at:
http://jerrygalloway.com/papers.htm

Based on a recent survey of parents and children (National School Boards Foundation, 2000) by the time children are teenagers, nearly three out of four are online using the internet. Our society is clearly becoming a nation online, a technological world, especially among children. While computers have been in our schools for more than a generation (since before the middle 70's), educators are still concerned with how to integrate technology into instruction. Why has this issue or goal not been successfully addressed among educators over the past 25 years?

Teachers in our society are expected to lead rather than follow children to mastery of the world in which they must live and work. If teachers are not leading, then children will inevitably learn on their own. As the rock-n-roll generation grew to adulthood, whose music was originally considered renegade, subversive or rebellious, that same music is now integrated into established adult society. Even elevators today play themes originally found on the 45 rpm records of adolescents. Young people from generations past, without guiding classroom leadership, brought with them elements of a culture exclusively their own and simply by virtue of growing to adulthood replaced established society with their own. The same is becoming true of the computer generation. Young people, learning technology without significant leadership from educators, are learning on their own. They have grown - are growing – to adulthood to establish a new cyber-society as a new standard. Unfortunately, educators are following instead of leading.

For a full generation educators have presumably been about the business of integrating technology. The tech-limitation of the novice teacher is as important today as 25 years ago. Being a total beginner to computing today is the same as 25 years ago. Certainly there is a kind of societal "tech-awareness" that is different today but not knowing is not knowing. Beginners are beginners. Society's cyber-development does little to provide an education for interested teachers who know nothing of technology. And, contrary to the mission of today's teacher trainers, you cannot get a generation of non-computer-users to integrate classroom technology for children. Instead, enable teachers to be technology-users and classroom implementation will follow.

However, teachers' perspectives skew their expectations and attitudes about computing experiences and limit if not preclude the achievement and acquisition of computing knowledge and problem solving skills. This author suggests a relational link between (a) teachers' educational expectations, (b) computer educators' notions of how teachers learn computing, (c) what administrators believe teachers need, and (d) teachers' personal commitments to computing. It is suggested that this relationship accounts for the 25 year failure of technology integration.

Quite common today, teachers expect recipes for using technology. Simply stated, they want to be shown how to do something with computers without actually learning to use them. Teachers invariably seek to be given procedures to follow, packaged lesson plans to implement, imaginative and representative applications of technology that they can carry back to the classroom and put into practice in teaching. This is a popular notion among many teacher and technology educators and seems on the surface to make sense. This idea as a goal for empowering teachers with technology for the benefit of school children seems quite appropriate at first glance and is thought to withstand any criticism as noble and obviously beneficial for the target group.

The problem of course is simply that this does not constitute learning anything. That is, the teacher (the technology user) never actually learns to be a competent user. This misconception about what it takes to successfully bring technology into teaching precludes experiencing concept-building and other valuable competence-building activities. That is, teachers resist those experiences that have no obvious classroom applications.

The intuition, problem-solving and critical thinking abilities consistent with learning and mastery are not commonly recognized as vital for classroom integration of technology. Such elements of education require one to change. To risk over dramatizing, becoming a competent user of technology involves a transformation as one acquires an education – a mastery. Teachers don't want to change and prefer instead to merely pickup copies of their recipes and thus their mindset precludes being educated at all.

Empower Teachers: A Prerequisite to Integration

Leading the call for a focus on computer integration is a recent study that accounts for the current status of teacher technology-training programs across the United States (Moursund & Bielefeldt, 1999). Available equipment and beginner-level courses are thought to be sufficient for the purpose they serve but teachers still need more. The report recommends that computing instruction for teachers be integrated throughout the curriculum rather than isolated classes.

Educators should emphasize the importance of a personal commitment from teachers who are learning to use computers or who intend to use computers in teaching. Integration has failed to the extent that teachers have failed to personally adopt the computer in their personal and professional lives. This must change for integration to succeed.

Most commonly today, efforts at integration focus on helping teachers to use computers with and for classroom children. This might be fine for non-beginners and teachers well established in using technology but does not work for limited users or beginners. Empower teachers with technical skills, computing knowledge and intuition, and critical thinking skills in using computer technology. This is a prerequisite to focusing on technology integration into classroom teaching.

Summary

The goal is integration. The ultimate end is of course providing a state-of-the-art technological presence (instruction, resources, guidance, support, etc.) for school children. That's the purpose of education and why teachers exist. There are funds available for staff development, equipment, education or training programs. In any event, those resources are typically directed to using computers with or for classroom children to the detriment of the teachers. This approach has failed for over 25 years. The point is simply that you cannot get a generation of non-computer-users to integrate classroom technology for children. Instead, enable teachers to become technology-users and classroom implementation will follow.

Training and education are not the same thing. Other disciplines find a more appropriate balance of skills, knowledge, understanding, and intuition. Science, for example, clearly involves training and skill development in order to successfully conduct experiments of various sorts. Yet, in Science such skills and training are clearly a means to a different end. Such skills are not the end in themselves. They support and make possible the development of a conceptual understanding, critical thinking and problem-solving skills. This must be true in educational computing and instructional technology as well if teachers are to continue to adapt to the quickly changing world.

Full expanded version of this paper available on-line: **http://jerrygalloway.com/papers.htm**

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Traeger Technology Target: Completing the Circle of Community

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Abstract: The goal of the Traeger Technology Target project is to provide the opportunity for pre-service educators, K-12 faculty, and university faculty to form a learning community. The project facilitates the following objectives: university undergraduates will begin to bridge theory and practice through the authentic learning experiences afforded only through classroom practice; K-12 faculty will share their expertise in the areas of curriculum development, instructional strategies, and classroom management with pre-service teachers; and, university faculty will facilitate the interactions between the pre-service and in-service educators while providing appropriate technology skills in a just-in-time setting for both groups. The theoretical framework for this project is profoundly constructivist and supports the notion of service learning.

Introduction

The traditional instructional technology course of many preservice teachers' experience is undergoing a fundamental change. Just as K-12 educators have come to reconsider the traditional placement of computer technology in central lab facilities, so also are colleges of education beginning to question the wisdom of isolating digital technology as if it were a separate subject area rather than a rich tool for facilitating student learning. Current NCATE standards focus on the need for university faculty to model the use of technology throughout the undergraduate education student's coursework. However, many university faculty are in much the same position as their secondary counterparts. Faculty at both the secondary and higher education levels face both intrinsic and extrinsic barriers to implementing the use of technology in their classrooms. Brickner (Ertmer & Hruskocy 1999) proposes that extrinsic barriers include lack of access to computers and software, insufficient time to plan instruction, and inadequate technical and administrative support while intrinsic barriers may include beliefs about teaching, beliefs about computers, established classroom practices and unwillingness to change.

While university faculty struggle to learn technology skills as well as the means for integrating curriculum with technology, the stand-alone course, properly conceived, may continue to serve as a vital area of focus on the application of technology to curriculum. The challenge for the instructor of that course then becomes to consider how linkages can be created between the university students, the course concepts, robust content, and the K-12 classroom. This experience can be significantly enriched when genuine efforts are made at creating a learning community consisting of university undergraduates, university faculty, K-12 faculty and their students. University undergraduates can assist K-12 teachers in the design of instructional materials, student instruction, and web resources while the K-12 teachers assist the undergraduate students in creating units of study that include logical use of available technology resources and real-world application of technology skills.

The Traeger Technology Target (TTT) project engages a University of Wisconsin Oshkosh instructional technology class of 24 undergraduate students in a collaborative project with four educators teaching multiage fourth-fifth grade classrooms at Carl Traeger Elementary School. The project spans two semesters - fall 2000 and spring 2001 - and thus two different groups of undergraduate students. The project provides an authentic opportunity for university students to apply technology knowledge and skills acquired during their university class in an environment that fosters the connection of theory and practice. In turn, the practicing educators at the elementary school develop an increased awareness of the technology resources available at the site, their application, and have the time to consider how to integrate that technology with their curriculum. Elementary students benefit from the continual assistance of the undergraduate students in their

portfolio development, literature circles, and the use of the World Wide Web as a learning tool. University faculty remain available to all Traeger teachers in the consideration of curriculum-technology integration. A balance is sought whereby undergraduate scholars, university scholars, and teacher scholars may begin to truly address the four components of scholarship at all levels: teaching, discovery, integration and application (Boyer 1990).

This collaboration benefits all participating groups in a manner consistent with the notion of *service learning* whose relevance at all levels of education has been affirmed (Lynton 1995). The literature on service learning supports the view that educational institutions from elementary school through higher education must develop formal relationships with one another that mutually benefit all concerned. It is envisioned that this project may serve as consideration by other instructional technology courses as it seeks to build a learning community with the shared purpose of improving education for all students.

Additionally, the ISTE National Educational Technology Standards for preservice teachers repeatedly stress the critical need to provide the opportunity to link theory with concrete field experiences. Specifically, this is found in the essential conditions of the document within the shared vision, skilled educators, professional development, student-centered teaching, and community support areas.

Background

The University Instructional Technology Course

The junior-level, three-credit instructional technology course in the College of Education at the University of Wisconsin Oshkosh has been in a state of transformation over the last five years consistent with the prevalent view of technology as a powerful learning tool for students. Originally conceived as a stand alone, skills acquisition course, it has been afforded the opportunity to evolve into a course focusing on the integration of curriculum and technology. This change in focus has been made possible (and necessary) because of the implementation of a prerequisite requirement to the course that focuses entirely on computer skills, by the increasing sophistication of the undergraduate students themselves, and by the needs expressed by surrounding school districts. Various strategies have been implemented with one of the most successful being the linking of one section of instructional technology course with a corresponding secondary level methods course (i.e. social studies, science, math, etc.). Students are co-enrolled in both course sections, usually in back-to-back time periods which affords ample opportunities for interaction between both the methods and technology course objectives and professors. However, such a structure for the elementary pre-service teachers has not been found to be suitable given the parameters of the program structure.

The instructional technology section that participated in this project during the fall 2000 semester consisted of 24 junior level students. Fifteen of these students were pursuing elementary licensure exclusively, 5 were pursuing dual licensure in special education and elementary education, while the remaining four represented combined elementary and secondary licensure in music, physical education and Spanish or ESL. Students were not notified of the intensive off-campus component of this course section prior to enrollment and were given the option of transferring to other sections after the first class meeting. Of the original 27 students enrolled, three transferred with the remaining 24 students enthusiastically opting to stay with the project. They were cautioned that this project represented an untried formula for both the college and the elementary teachers and that the design would be evaluated at iterations by all parties and modified based on most current feedback.

Carl Traeger Elementary School

Carl Traeger Elementary opened in 1997 and serves almost 600 students in kindergarten through fifth grades. It was originally designated as a technology-intensive school and has a large computer lab as well as small minilabs located in each of the learning pods throughout the school. The principal is very supportive of technology as one of the many hands-on experiences afforded students. Teachers at the school are acknowledged within the district as innovative and creative and are proud of their use of a variety of instructional strategies aimed at encouraging student excellence according to individual abilities. The elementary school is physically attached to Carl Traeger Middle School and benefits from both enhanced facilities and placement opportunities for students. Unique to the school is the availability of both multi-age and grade level classroom configurations.

Four teachers at Carl Traeger elected to participate in the TTT project. These teachers team-teach in pairs; each pair has 48 fourth and fifth grade students in a classroom consisting of two large instructional spaces joined by a common student area and a common teacher office. Thus the entire project dealt with four teachers and 96 fourth and fifth grade students.

Project Design

The impetus for the Traeger Technology Target project came from the Preparing Tomorrow's Teachers to Use Technology Capacity Building Grant received in 1999 by the College of Education and Human Services. Part of that grant specified the need to design means for undergraduate students to observe and practice curriculum-technology integration throughout their years at the university. Thus funding was available to pay stipends to the teacher participants and to support transportation between the two sites. Cooperating teachers were recruited through another grant initiative, Wisconsin Regional Instructional Technology Support, that affords districts the opportunity to provide constructivist technology workshops given by outstanding area teachers.

University faculty and Traeger faculty met at intervals during the summer to discuss the direction of the collaborative effort. Central to these discussions was the expression of the needs of the various project constituents. University faculty desired an authentic context for the work done by their undergraduate students with content that was directly from the field and applicable to a real classroom setting. Traeger faculty wanted assistance in designing published background materials for parents of their students, ideas on how the World Wide Web could assist their own teaching and their students' learning, and assistance on instructing students on various software applications. They also expressed the need for planning time to develop units of practice that made use of technology tools and a curiosity about electronic student portfolios. As these needs emerged the context and content evolved for the university undergraduates.

Based on stated needs, an ambitious project was developed with the full understanding of all faculty involved, and eventually undergraduate students in both the fall and spring semesters, that various components would be distributed over the two semesters. That is, the second semester would build upon the experiences of the first, independent of the fact that the university class composition would significantly change.

The university undergraduate students were initially divided into four production teams. Each team was assigned to one of the four mentor teachers. This facilitated e-mail communication while providing the structure that enabled development of brochures, literature circle journal partners, and a unit of practice. At various times throughout the semester, the students were rearranged into pairs to develop webpages and HyperStudio stacks. Students also worked one-on-one with 4/5 students in development of PowerPoint student portfolios.

To be respectful of the travel time required between the university and the elementary school, every effort was made to keep elementary site visits confined within the time period of the university course. While the instructional technology course meets twice weekly for an hour and a half, there are twenty-minute breaks on either side of the course. Most students found this to be ample time to get to the elementary school. Teams were not scheduled to visit the school all at the same time; that is, work teams one and two might be working at the elementary school while teams three and four remained at the university working in the lab. This minimized the confusion and influx of numbers at Carl Traeger School. The only time that all teams visited the elementary school at the same time was on the last day of class in the university semester that served as a time for community sharing and celebration.

Project Components

The following tables outline the artifacts originally proposed for the collaboration, the process involved in those projects, and correlates the product with both the university class need and the 4/5 classroom need.

Artifact 1: Introduction WebPage			
IT Focus	4/5 need	Product	Process
• Rudimentary web publishing skills	4/5 grade students needed	Simple web page	1. UW Oshkosh students divided into work teams

• WWW as virtual community • Use of digital camera	introduction to the university students		2. Each team constructed webpage using Netscape Composer, individual pictures, and table design

Artifact 2: Tri-fold Brochures on philosophy and instructional strategies relevant to classroom program			
IT Focus	4/5 need	Product	Process
• Authentic assessment • Multiage classrooms • Continuous quality improvement • Brain research • Design basics • Desktop Publishing	Detailed program information for parent community	Tri-fold brochures	1. Traeger teachers provided background materials 2. UW Oshkosh students met with Traeger teachers for clarification and discussion of content 3. UW Oshkosh students developed brochures within work teams 4. Traeger teachers provided feedback and input 5. Brochures distributed to parent community

Artifact 3: Use of Telecommunications to facilitate student discussions on WWW			
IT Focus	4/5 need	Product	Process
• Telecommunications • Collaboration on WWW	Discussion partners for literature circles	Threaded discussions with groups on selected topics for trade books read in literature circles	1. Traeger teachers provided trade books selected for literature circles for UW Oshkosh students 2. UW Oshkosh students assigned to different literature circles 3. UW Oshkosh develop discussion questions in collaboration with Traeger teachers 4. UW Oshkosh students led discussions in literature circles via WWW

Artifact 4: Use of Hypermedia software with elementary students			
IT Focus	4/5 need	Product	Process
• Understanding of brain research • Application of new knowledge to HyperStudio program • Introduction to storyboarding as a pre-project strategy	Introduction of fourth grade students to HyperStudio software and final project for science unit	HyperStudio stacks on weather created by 4/5 grade students working in pairs	1. Traeger teachers provided 4/5 grade students with ample background information, research and collaboration opportunities, and detailed rubric for project. 2. UW Oshkosh students worked with student pairs at elementary school to storyboard HyperStudio project. 3. Traeger 4/5 grade students traveled to university computer lab to begin project 4. After 3 weeks of working on project back at elementary school, students again returned to university to finish project and demonstrate it to their undergraduate student partner

Artifact 5: Use of Presentation software as an electronic portfolio medium			
IT Focus	4/5 need	Product	Process
• Use of presentation software for electronic portfolio • Knowledge of PowerPoint • Scanning, PDF files	Cohesive means of presenting portfolio progress and achievements during first quarter	PowerPoint portfolio presentation for each student	1. Traeger teachers set portfolio assessment requirements at beginning of school year, had students document and collect artifacts, graph progress etc. 2. 4/5 students used digital camera throughout quarter to record science experiments, dinner theatres, etc. 3. Traeger 4/5 grade students traveled to university computer lab to begin

			electronic portfolio project 4. After 3 weeks of working on project back at elementary school, students again returned to university to finish project and demonstrate it to their undergraduate student partner

Artifact 6: WebPages Developed as Student/Teacher Resource			
IT Focus	4/5 need	Product	Process
• WWW as an instructional tool • Resource gathering on WWW • Evaluation of appropriateness of material on web • WebPage production using Claris HomePage	Web resources to support literature circles	Webpage supporting tradebooks used in literature circles	1. Traeger teachers provided list of all available tradebooks for literature circles 2. Undergraduate students, working in pairs, selected one book 3. Traeger teachers provided copies of selected books for undergraduates 4. UW Oshkosh students read books and developed webpages providing a brief introduction to the book, reference material about the author, other pertinent websites, suggested projects, and links for educators

Artifact 7: Unit of Study integrating subjects, curriculum and technology			
IT Focus	4/5 need	Product	Process
• How a teaching unit is conceived • Steps in development of unit • Software evaluation • Strategies for integration of subject matter and technology • Telecommunications for professional collaboration	Social studies resource materials	Unit of study demonstrating integration of curricular subjects as well as integration of curriculum and technology	1. UW Oshkosh work teams and Traeger teachers met to decide on focus of unit of study 2. Traeger teachers supported undergraduate students with materials, suggestions, feedback and guidance 3. UW Oshkosh work teams developed four-week committee cycle and whole group activities to support colonial America unit.

Discussion

As of the submission of this paper for publication, the first semester of the Traeger Technology Target is just two weeks away. Six out of the seven artifacts detailed above were accomplished during the semester. Given lab size constraints at the university, it was decided to implement the PowerPoint electronic portfolio during the first semester with 48 of the elementary students and to implement the HyperStudio project in the spring semester with the remaining elementary students.

Feedback obtained throughout the semester from the undergraduate participants has been overwhelmingly positive. One student, when reflecting upon the opportunity to work with the elementary students in the college computer lab, said, "This is the first time I've ever seen kids in this building. This is the way it should always be… we can learn so much from them - more than they could ever learn from us!" Another stated, "I was so scared because I wasn't that sure of myself with PowerPoint…but my student and the kid next to him were both familiar with it so they taught me some things. I can see from this that technology is an area that I must be willing to become the learner in, which is all right. Since I didn't have to teach them to do the program, I could spend lots of time talking with them about their accomplishments during the nine week period." One young woman summed up her experience, "My students did not know how to do anything with the program [PowerPoint] but they did come with their portfolio information up-to-date and their experiment photos on disk. It was difficult for me to keep my hands off of the keyboard - to allow them to make their own mistakes and learn on their own. Ultimately, however, this was for the best because they learned from one

another rapidly and we could spend a lot of time sharing what they had learned from the experiences they chose to illustrate in their portfolio."

The elementary aged students were proud to have been associated with the university undergraduates and were particularly thrilled with the opportunity to "come to school with the big kids". In viewing one of the web pages created as a resource for Jean Craighead George's book *My Side of the Mountain* one elementary student remarked, "This website is really easy to read…it has some ideas that I think I'll use for my final project." One student, while presenting her portfolio to her undergraduate partner, stated, "I would never have been able to finish this without your help….My dad was so impressed and didn't really believe that I knew how to do all that stuff until I sat down at home and showed him!" Another added, "I haven't shown my parents yet but I'm glad I'll get the chance to practice here - it's fun to see all the stuff I've done this year in one place - the year's just beginning and I already have a whole lot!"

The teachers at Carl Traeger Elementary are pleased with what has been accomplished this semester with their fourth and fifth grade students. They feel the collaboration has been beneficial to them as well. One educator enthusiastically endorsed the project saying, "As a new teacher, I remember desperately wishing that I'd had more opportunities to work with students while I was an undergraduate. I think that we have a responsibility to mentor these students and provide for them the experiences so necessary prior to entering a classroom." Another noted that undergraduate students have so little experience on which to apply theory and mused that perhaps an apprenticeship approach would better serve the profession rather than the traditional student teaching model.

Conclusion

It would hardly be possible to offer an informed conclusion to this project as only twelve weeks of the expected twenty-eight week project life have been completed. However, at this juncture, the project has been successful in engaging undergraduate students with authentic content and experiences within four elementary multiage classrooms. The fourth and fifth grade students in those classrooms have benefited from the presence of the undergraduate preservice teachers. The faculty participants at Carl Traeger Elementary are pleased with the informational materials published by the students, the provision of an authentic context for World Wide Web and telecommunication usage by their students in their literature circle discussions, the affordance of instruction in software programs by the undergraduate students, and the opportunity to share their expertise and experiences with the next generation of teachers. Preservice undergraduate students, university faculty, practicing educators, parents, and students: the Traeger Technology Target is beginning to foster a learning community.

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On-line Exams: Design, Development and Implementation

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Abstract: This paper is intended to provide educators with a basic understanding of the creation, development, and implementation phases of on-line exams. The content includes an overview of on-line exams to explain the specific features and the advantages and limitations of this medium. Design and development are also presented to explain the different test development tools. The implementation phase covers areas of administration and distribution based upon personal experiences.

As the impact of Internet grows in education, more educators have turned toward computers as an instructional vehicle for delivering courses and course materials. There are three categories concerning the use of Internet in teaching and learning: (1) utilizing specific attributes of the Internet in creating supplemental on-line materials, (2) developing inclusive courses in which students take on-line, and (3) offering complete degree programs on-line. Regardless of the category in which these educators fall under, the Internet will be a major factor for delivering instructional materials to learners.

The use of computers in teaching and assessment already has a considerable history within education and training. However, the rise of the Internet presents new opportunities for many aspects of education, particularly assessment. With the Web technology, it is possible to construct on-line tests that are: (a) available beyond the walls of the classroom, (b) independent of paper or other physical resources (apart from a computer and access to the Web), (c) immediately graded with assurance of objectivity, and (d) used for formative or summative purposes (Dalziel & Gazzard, 1998).

The purpose of this paper is to provide educators with basic information and resources concerning the development and implementation of on-line exams. The paper is organized into five areas of discussion. First, an overview of on-line exams will be provided to assist readers in understanding what it can provide and the features pertinent to on-line exams. Second, a review of advantages and limitations of on-line testing will be given. Design issues such as layout, flow, and planning will be the third area. The fourth area touches upon the development phase that includes a discussion of related software and on-line course authoring tools. Finally, the implementation phase will cover areas of administration and distribution based upon the authors' personal experiences.

Introduction

Interactivity on the Internet is one component that educators have been drawn to recently. On-line assessment has been growing in popularity and educators have been exploring different ways in which exams could be delivered to students on-line.

On-line exams are simply defined as a mode of delivering tests, quizzes, and surveys via computer in a synchronous or asynchronous mode. An example of a synchronous environment would consist of students taking the on-line exam during class time where the teacher can monitor students' behavior. An asynchronous environment is where students are taking the exam at their own chosen time and at their own pace either in a monitored (e.g., testing center, library, school computer lab) or unmonitored (e.g., home, work) situation.

Web-based assessment provides a way to administer, grade, and record a test via the Internet. Students can easily take the test by accessing the Web site. They enter their names and other information like an ID number and password. They are then presented with the test. When students have completed the test, they click on a "submit" button. Immediately, the test is graded and the results are shown. Questions answered incorrectly are shown with the option to reveal the correct answer in company with a brief explanation supporting the correct answer.

The types of on-line exam questions vary and are dependent upon the purpose of the exam itself. Most commonly used types are the true-false, multiple-choice, and fill-in question objects. Most on-line test development tools provide educators with a way to create questions and assign answers with individual scores. These question types can be graded automatically. Another question type is the short-essay. Short-essay questions cannot be graded by the computer, and thus, requires the instructor to grade the question individually. However, scores obtained from the short-essays can be added automatically to the scores from the computer-graded exam questions. Thus, writing for an exam to be delivered on-line do not vary much from the paper tests except that now the student and teacher both need access to a computer with Internet connection.

Strengths and Weaknesses

On-line testing has several advantages. For one, on-line testing is not restricted to time and place. On-line testing has the ability to deliver tests efficiently and effectively in asynchronous mode. Thus, timeliness is an advantage that educators have been drawn to as a result of on-line testing. Convenience and access are added benefits to non-traditional students.

Immediate feedback is an area of importance for many educators who have adopted the Internet as an assessment vehicle (Kibby, 1999). Allowing students to view how well they performed on exams is an excellent way to reinforce learning, a feature found with most on-line assessment tools. Once students complete the on-line exam they can immediately examine their performance by viewing their overall score and discern which questions they answered wrong and find what answers were correct. In addition, instructors can add personal feedback to on-line questions to help the learning process. For instance, if instructors not only want their students to view the correct answer but explain why that answer is the right one, on-line assessment tools can provide that extended, immediate feedback. This way, students will remember the question more if the feedback occurs directly after completing the exam as compared to reviewing the exam a week later (Jonassen, 1988).

Interactive multimedia is another advantage of on-line testing. The primary strength of on-line testing in this area is to allow educators to create test items that incorporate other types of media besides text. On-line exams can incorporate visual, aural and interactive components. Multimedia elements such as charts, graphs, photos, animation, audio, and video can all be incorporated into the on-line exam.

Student tracking is a feature of on-line exams that can be of an asset to teachers (Juchnowski & Atkins, 1999). For teachers, on-line student tracking can provide them with information such as date and time in which students accessed the test site. It can also tell teachers whether students have made several attempts at taking the exam. Finally, student tracking provides teachers with information such as the length in which the students took the test. This could be beneficial in assessing whether an extended time-length could be a result of the student not understanding the material, especially when other students completed the exam in half the time.

On-line testing also provides statistical analysis that has been traditionally done by hand or calculator. Many test development tools provide instructors with the option to calculate the test scores for each student and provide an electronic grade book for all the students. On-line testing programs also provide instructors with other statistical analyses such as means, modes, medians, standard deviations, and item analysis on each test item.

In short, on-line testing can provide students and teachers with timeliness and convenience, the opportunity to increase retention through feedback, provide interactive multimedia to maintain interest, track and manage test scores, and obtain computerized statistical analyses. For these reasons, the use of on-line testing has experienced a significant increase and will continue to flourish in years to come.

On-line testing does have several limitations worth mentioning. Time is a major factor in developing on-line exams. It requires a large pool of test items to be effective. Not only do instructors have to learn the test development tool, but they also have to develop the exams and upload them to the Internet. Network and server complications can cause a student to end the test prematurely and the

educator can loose all of the student's scores. This can double-up the management responsibilities of the instructor, and thus, take time away from the workday. However, once the exams are placed on-line, developing and implementing the exams are no longer a concern because the instructor can always modify the exam later.

On-line exams can also be impersonal (Juchnowski & Atkins, 1999). Often times, students take the on-line exams alone. If students are in a monitored situation (e.g., a librarian monitoring the exam period) with other students, the feeling of isolation will not be as overwhelming. In addition, students often do not get the chance to ask for clarification on puzzling questions as they would in a classroom environment. This can lead to student isolation and disenchantment that will hinder the student's academic performance and success.

Student integrity and cheating are other concerns for on-line testing (Juchnowski & Atkins, 1999). The common question that educators ask with on-line testing is, "How do I know whether the student sitting behind the computer is who she/he says they are?" The bottom line is that you will not know. Cheating is something that cannot be resolved either in an on-line environment or in a classroom. Although no one can guarantee that students taking on-line exams are not cheating, this should not sway educators away from using the medium because of the other advantages that on-line exams do provide.

Overall, although on-line assessment tools do have its limitations such as time consumption, remoteness, and student dishonesty, on-line assessment tools should not be disregarded. Depending upon the instructional situation, on-line exams can increase teacher productivity with better accuracy. For students, convenience and interactivity are major factors toward academic success.

Design

Creating and designing on-line exams are quite simple. In the past, educators had to know programming to create on-line exams. However, with the proliferation of the Web, there are many tools available to assist educators with various degrees of technical abilities to create on-line exams. Traditional instructional design models work well in terms of designing and developing on-line exams. The ADDIE and ASSURE (Heinich, Molenda, & Russell, 1993) models are the most popular and are similar in the way they present the steps toward designing and developing instructional materials, lesson plans, and in this case, on-line exams. In short, the steps toward designing on-line exams should include (a) assessing the learner, task, and learning environment, (b) generating objectives and goal, (c) designing the on-line exam and how it should be presented and delivered, (d) creating the actual on-line exam by writing test questions and developing the testing program, (e) implementing and delivering the on-line exam, and finally, (f) assessing the effectiveness of the on-line exam.

In the design phase, things such as layout, flow, and feedback should be considered. Depending upon the tool being used to develop the exam, the educator can have either some or an abundant amount of freedom in how he/she wants the on-line exam to look like, the types of questions to be included, and how the program will respond to students' answers. The following are design guidelines for those who are designing on-line exams:

- Keep the background design consistent for the entire exam and use a background that is not too busy such as textured patterns and those having more than two colors.
- If different types of questions (e.g., multiple choice) are used, keep the types grouped together and reserve the fill-in's and short answers toward the end.
- If feedback is provided to the student (e.g., telling students which is the correct answer and explaining why), the feedback should be presented at the end of the exam to prevent disruption.
- Use uniform placement of questions and answer choices (e.g., if answers are given on the right side of the first slide, then answers should always be presented on the right side).
- When working with fonts, keep the font style and typeface consistent, avoid double emphasis such as simultaneously bolding and underlining a word, keep colors to a minimum, and use the largest size of font for readability considerations.

These are considerations that one must observe when designing on-line exams. A few others are worth mentioning such as limiting the number of questions to be asked at one time to avoid student fatigue aand writing questions that are succinct and to the point. The later point is important because students who take on-line exams do not have the luxury of asking for clarification on confusing questions or unknown

terms. Hence, the design of on-line exams is critical to the success of the student, and thus, need to be taken seriously.

Development

Though there has been a growing array of software tools being developed for creating computer-based tests, many tools have been developed recently to facilitate the teachers in authoring, delivering, grading, and analyzing the tests on the Web. The selection of the software determines the placement of the question and answers, how the feedback will be provided, whether the score is shown to the student, the type of background design used, the style of fonts, and whether any multimedia or graphics is used. In general, there are five categories of tools that can assist with the development and delivery of on-line exams: (1) CGI (Common Gateway Interface) programs, (2) JavaScripts, (3) commercial testing programs, (4) authoring software, and (5) on-line course authoring tools.

CGI is a server-based method that can be used to implement on-line testing. There are a great number of CGI programs available on the Web and many of them are free. Exam Mail [www.oyston.com/ExamMail/home.html], Simple On-line Interactive Test-generator (SOIT) [www.cals.ncsu.edu:8050/soit/], Web Test [fpg.uwaterloo.ca/WEBTEST/], and Web Exam [www.admin.northpark.edu/lmartin/WWWAssign/] are some examples of the CGI programs for creating on-line exams. The advantages of CGI programs are: (a) the scripts will work with virtually any browser, (b) permit interactivity between a client and a host operating system through the Web, and (c) the scripts allow the creation of a test report or a follow-up messages to the learner. The primary disadvantage of CGI scripts is that the teacher must be more knowledgeable about computers and be able to edit the CGI scripts to get them to work. Often, some technical assistance will be needed to identify sever paths, etc. or install the scripts to the server. Some institutions also have strict rules for installing CGI scripts for security reasons. In addition, CGI programs are well suited only for presenting basic types of tests. More advanced and interactive types of tests (e.g., tests which involve drag-and-drop activities) cannot be implemented with CGI programs (Brusilovsky & Miller, 1999).

JavaScript is an interpreted scripting language that is embedded with HTML code to develop interactive Web pages. JavaScript processes information on the client side and works with all browsers. Most of the processing such as checking the correct answers takes place on the users' browser. It is most suitable for creating tests with multiple-choice, fill-in-the-blank, and true-false type questions. The main advantage of JavaScript is that form validation can be built in to provide immediate feedback to the students. However, the major disadvantage is that the source code cannot be hidden (Hazari, 1998). A learner can easily find answers from viewing the source code of the page. In addition, there is no way for recording the test results. Thus, the JavaScript-based exams are more appropriate for self-assessment than for assessments used in grading (Brusilovsky & Miller, 1999). There are many pre-designed JavaScripts that are made freely available for educators to use and customize. Examples of these include CASTLE [www.le.ac.uk/castle], Hot Potatoes Web Authoring Tools [web.uvic.ca/hrd/halfbaked/], Quiz Maker [www.attotron.com/pub/QuizMaker.html], and On-line Exercises System [math.uc.edu/onex/demo.html].

Besides using CGI and JavaScripts, commercial testing programs are also used to create and deliver on-line exams. These software are designed specifically for developing on-line exams. Generally, they are user-friendly and provide manuals and technical support. Some examples of commercial testing programs are Question Mark [www.questionmark.com], Interactive Test [www.interactivetest.com], Quiz Factory [www.learningware.com/quizfactory/], and Quiz Maker [www.mrtc.org/~twright/quizzes/quizcenter/].

A few authoring software that have the capability of providing on-line exams are ToolBook [www.click2learn.com] and Authorware [www.macromedia.com]. There are others, but ToolBook will be discussed in more detail because of our personal experiences with this. Advantages of using ToolBook include easy uploading of files to the server and the freedom to personalize the exam. Though the software is mainly intended for creating training modules or lessons, computer-based exams can be created and uploaded to the server, and thus, become on-line exams.

When creating exams in ToolBook, educators have the choice to select (a) the types of questions to use, (b) how the exam will be graded (e.g., point over a percentage value, grade each question individually as the student progress or wait to tabulate scores at the end), (c) how many points will be allocated to correct responses or subtracted for wrong answers, (d) whether feedback is given at all, and (e) randomization of questions so a student will not see the same order of questions more than once.

Uploading of the exam to the Web server is quite simple. ToolBook has its own Distribution Wizard that allows an educator with three choices: save as an .exe program, convert files to HTML and DHTML pages on the hard drive, and upload all pages directly to the server. ToolBook has a lot of dynamic HTML options in its program and has made it easy for the educator to upload files by automatically converting the files and including extension programs that are required for DHTML to work properly on the server. However, authoring software like ToolBook is expensive and requires a steep learning curve.

Examples of on-line course authoring tools include WebCT [www.webct.com] and Blackboard [www.blackboard.com]. These tools are provided on-line and educators have to be connected to the Internet to gain access to these sites. WebCT and Blackboard have their own design layout and instructors do have the options to change certain features such as the style of buttons and what buttons provide. However, the layout is consistent for all course sites. One major advantage of using these tools is the template. The on-line course tools contain primarily of templates that educators fill in with either typing the test items or uploading documents and files from the hard drive. No HTML programming is necessary. It is merely just filling in the blanks.

The only drawback of using on-line course authoring tools to create exams is inflexibility. The layout of the on-line exams is the same. Multiple-choice, true-false, fill-in, and short answer questions can all be used, but the appearance will be the same no matter which course Web site you are accessing. Feedback is possible, but it can only be given at the end of the exam. In addition, students have to scroll down to answer questions that may not appear in the window. This can be distracting and cumbersome. Thus, limiting the amount of questions for each exam needs to be done. Nonetheless, ease of use and economic convenience are reasons why educators should investigate on-line course authoring tools as an option for developing and delivering on-line exams.

Implementation

Administration and distribution are critical for successful implementation of on-line exams. Certain factors need to be addressed ahead of time before making the final leap to offer exams on-line. Based upon personal experiences, these are just a few of the areas that need to be investigated before deciding to deliver exams on-line.

Network capability is the first area of consideration. There are several aspects that instructors must examine. First, one must find out whether the server he/she is uploading the files to is software-friendly. In other words, will the server be compatible with the chosen test development tool. For instance, many school servers have strict firewalls that do not allow certain scripts or Applets to be used because of security reasons. Second, one must consider the computers that the students will be using. Assessing whether students have access to the proper equipment, and even the proper browser and plug-ins, is important. If students cannot gain access to the on-line exam, then the whole purpose of offering on-line exams in the first place is defeated.

Staffing is another important issue concerning the implementation of on-line exams. The instructor may not be the only one responsible for administering and delivering on-line exams. Others may include teaching assistants, administrative assistants, and test monitors (e.g., testing coordinator, librarians) who need to be trained. If students are required to attend a facility in which their exams are to be monitored, then the other individuals will come into play. In short, when on-line exams become a heavy part of the curriculum, others will eventually become involved.

Support is vital toward the success of delivering and administering on-line exams. When situations arise that require troubleshooting, a supportive and competent technical staff is important. Often the companies that provide the software or on-line course authoring tool provide support, but that support is not always immediate or even effective. Thus, instructors need someplace else to turn for assistance. In addition, not only do instructors need assistance, but students. If students are taking the exam in a monitored situation, it is important that the test facilitator or librarian knows how to use the program (Kibby, 1999). Problems will arise if the monitor does not know anything about the program students are using. No matter who is the monitor, students will consider that person as the instructor and expect the same. Therefore, the support structure must be considered before implementing on-line exams.

Student integrity is the final area of consideration. Issues surrounding cheating and plagiarism exists with on-line exams as they do for in-class exams (Juchnowski & Atkins, 1999). No one will ever circumvent cheating, and thus, should not be used as an excuse to denounce on-line exams overall.

However, student integrity is an issue and needs to be approached carefully. One suggestion is to develop the on-line exam with the intention that it will be offered as an open-book or take-home test. Although the exam may not be open-book, one must consider the fact that students will be taking these exams on their own, even in a monitored situation, and will have the opportunity to cheat. Thus, one might even consider on-line exams as take-home tests, thus eliminating instructor's concern of deception. In short, if the assessment requires strictly controlled conditions and requires a high degree of security, then delivering exams on-line should not be performed (Kibby, 1999).

There are many more issues that involve the implementation of on-line exams. However, network capacity, staffing, technical assistance, and student honesty are major concerns that have been brought up repeatedly. For these reasons, educators must have a contingency plan to deal with unforeseen technical difficulties such as the server being down and for handling disciplinary issues. As long as the educator is aware of these problem areas and anticipates such obstacles ahead of time, then the implementation process will be much more successful.

Conclusion

Testing has always been an important part of the instructional process for traditional classroom courses as well as Web-based courses. The goal of testing is to determine if learning objectives have been accomplished by providing feedback to the instructor of what students are understanding and the areas that need further explanation or clarification (Hazari, 1998). Assessment is also a powerful motivator of student learning. With the rise of the Internet, Web-based assessment has also grown considerably in education. Appropriate use of Web-based assessment can play an important role in student learning while at the same time reducing teacher workload. Many authoring tools are now available to facilitate educators in authoring, delivering, grading, and analyzing tests on the Web. Web-based assessment has demonstrated its ability to deliver exams efficiently and effectively at anytime and anywhere. Thus, on-line assessment will continue to grow in years to come.

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Using Anchored Instruction to Teach Preservice Teachers to Integrate Technology in the Curriculum

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Abstract: Twenty-two preservice teachers involved in a cohort group were enrolled in both an educational computing class and a curriculum development class in the same academic quarter. The instructors for both courses collaborated their teaching efforts whereby the preservice teachers used the educational computing class to research, record, and document their experiences in the curriculum development course. The theme of the curriculum class was therefore used as an anchor for the educational computing class. This paper describes how the technology instructor structured the educational computing class around this anchor. It also describes the lessons learned from this collaborative experience. The paper includes some reflections from the preservice teachers that highlight some advantages of this collaborative process from the preservice teachers' perspective. The paper concludes with suggestions for implementation of similar teaching designs to allow other technology instructors to take advantage of the benefits of anchored instruction in teaching technology to preservice teachers.

Introduction

The infusion of information technology into the teaching and learning process is challenging to preservice teacher preparation programs. Yet these programs are viewed as the most direct and cost-effective way to prepare the approximately 2 million new teachers who will be teaching in the next decade (National Council for Accreditation of Teacher Education [NCATE], 1997).

Although institutions of higher education vary in their specific responses to this challenge, most institutions require at least one educational computing course as a core component of their teacher preparation programs (Leh, 1998). Such courses play a critical role in introducing preservice teachers to fundamental information technology components and skills (Kim and Peterson, 1992).

In a recent study, Leh (1998) studied design and structure of educational computing courses in teacher preparation programs. The study indicated that each university has its own way of preparing their students for the use of information technology in educational settings. The structure and content of the courses also vary from one university to another. One approach to the design of such course involves using a theme or anchor around which various learning activities take place. This approach has been referred to as "anchored instruction" (Bransford, Sherwood, Hasselbring, Kinzer, & Williams, 1990). This model provides learners with a "situated, authentic and social learning environment" which encourages problem solving (Shih, 1997).

Anchored instruction has been suggested as a model of instruction that "can be used to show preservice teachers how to integrate appropriate technologies in their teaching..." (Bauer, 1998). This paper describes the experiences of a cohort group of preservice teachers who used their curriculum development course activities as an anchor in their educational computing class.

Using Coal Project as an Anchor

Twenty-two preservice teachers involved in a cohort group were enrolled in an educational computing class and a curriculum development class in the same academic quarter. In the curriculum development class the preservice teachers worked with a class of eighth graders in a local Junior high school. The eighth graders were involved in an expeditionary research project in the local community. In the project the Junior high school students, together with their teacher, researched the question of whether a local controversial coal mine should have been reopened. The students gathered different perspectives from the local community. One way was by visiting and interviewing different groups of individuals in the community. In the end the students presented a readers theater depicting the different voices represented in the coal mining controversy.

The preservice teachers accompanied the eighth graders in this coal project expedition to learn along, and from, the experiences of the eighth graders. They worked together with the eighth graders (as learning teachers) to plan the field trips involved, prepare interview scripts, and to prepare scripts for the readers theater. In the educational computing class the preservice teachers were involved in hands-on sessions where they learned how to use various technology applications for personal and professional use as teachers. These applications included Word processing, KidPix, PowerPoint, Database, Spreadsheets, and HyperStudio.

The technology course and the curriculum course instructors collaborated their teaching efforts whereby the preservice teachers used the educational computing class to research, record, and document their experiences in the expeditionary learning process. The theme of the curriculum class was therefore used as an anchor for the educational computing class. This paper describes how the technology instructor structured the educational computing class around this anchor. It also records the lessons learned from this collaborative experience. The paper includes some reflections from the preservice teachers that highlight some advantages of this collaborative process from the preservice teachers' perspective. The paper concludes with suggestions that other technology instructors can draw from to implement similar teaching designs that would allow them to take advantage of the benefits of anchored instruction in teaching technology to preservice teachers.

The two instructors involved in this teaching experience conducted a study of their collaborative teaching activity for the purpose of improving instruction in their respective areas. A qualitative inquiry was used to gather data. The instructors kept daily journals of their experiences. At the end of the quarter, each preservice teacher wrote a reflection paper based on the collaborative learning experience. The journal and the reflective papers were the main sources of data.

Structuring the Technology Course Around the Anchor

The goals of the educational computing were based on the ISTE standards which aim at preparing teachers to use technology for acquisition of basic computer/technology operations and concepts, personal and professional use of technology, and integration of technology in instruction. The preservice teachers spent some time learning the skills involved in using various applications. This was followed by activities that gave them opportunities to practice the use of these application within the setting of the anchor. The following is a description of how the activities around each technology application emerged from the theme, content, and activities of the curriculum development course.

Word Processing. On the first meeting of the educational computing class, each preservice teacher used word processing to write an introductory story to the eighth grade partner that he or she would be working with. They also used a digital camera to take personal pictures. They inserted these pictures in their stories. The preservice teachers later shared these stories with the eighth graders.

Web searching. The first meeting of the curriculum class involved a brainstorming lesson around the questions "what do we know about coal mining, and what do we want to know?" After listing down several questions, the next task at hand was "how are we going to find out what we do not know." This became an opportune time to introduce web searching. In the following educational computing class the preservice teachers used different search engines to search the Internet for information about the topic of coal and coal

mining. The preservice teachers created annotated bookmarks of resourceful sites, and saved them on floppy disks. They shared this bookmarked resources with the eighth grader on the next meeting.

PowerPoint. One curriculum class involved a discussion of the principles of expeditionary learning. The next technology class involved reviewing the expeditionary learning web site (ELOB) for further information. The preservice teachers then created a PowerPoint presentation around the topic of expeditionary learning based on materials covered in the curriculum development class and information gathered from the web.

Spreadsheet. The eighth grade class and the preservice teachers spent one session planning a field trip to the coal mining area in question. In this session the eighth grade teacher involved the students in an activity aimed at figuring out what they needed for the trip, how much money they would need, and how to raise the funds. In the next educational computing class spreadsheets were introduced to spreadsheet as a possible trip planning application.

HyperStudio. The eighth graders and the preservice teachers engaged in several research-oriented activities aimed at providing information around the questions on coal mining. These activities involved interviewing different players, visiting coal-mining areas, and searching materials and information from the library. The preservice teachers used HyperStudio to document this entire experience. During the fieldtrips digital cameras were used to capture different scenes. These graphics were woven into the HyperStudio multimedia presentations.

Database. To help them keep track of the different components of the learning experience, the preservice teachers used a database. Some preservice teachers were able to use the screen capture option of Macintosh computers to use these weekly database presentations as part of their HyperStudio stacks.

Inspiration. One session of the curriculum class involved concept mapping. The eighth grade class mapped out, on a chalkboard the different aspects of coal mining that they would explore in the expedition. This became an opportune moment to introduce inspiration as a concept mapping application. The preservice teachers later used these maps as part of their multimedia stacks.

KidPix. In the culminating project in the curriculum class, the eight graders worked with the preservice teachers to set up a readers theater. KidPix was introduced as a possible readers theater presentation application. Some of the preservice teachers used KidPix slide shows depicting some of the perspectives represented in the readers theater.

Reflections and Discussions

Flexibility. In this study, the content for the anchor was open-ended and evolutionary in nature in the sense that no one could determine ahead of time either what the eighth grade class was going to find out during the expedition or the sequence of activities they would need to take to complete their task. As the learners (eighth graders) explored the task ahead of them, they identified their own questions and these questions became the basis for formulating goals and designing the activities that would lead to the realization of these goals. One of the goals of immersing the preservice teachers in this collaborative teaching/learning experience was to emphasize relevance of technology in teaching and learning by allowing the preservice teachers to use technology in a real life setting. To achieve this goal, it was important for the activities of the technology class to relate closely to those of the anchor.

One of the challenges of anchored instruction is for the instructor to know "how and where to fit anchored instruction into the existing curricula ..." (Baumbach, Brewer & Bird, 1995). The existing curriculum in this case was for the preservice teachers to learn the use and application of various technology applications for teaching/learning environments. Relating the activities of the technology class to the anchor, and fitting these activities within the curriculum of the technology course necessitated planning the technology activities as the content of the curriculum class evolved. It therefore became necessary for the technology instructor to attend the curriculum course class sessions. This created a great demand on her time, but as she reflected, "this was the only way I could make the assignments and class activities meaningful. I had to know what they are doing in the other class in order for me to create corresponding and complementary activities for them." This suggests the need for flexibility on the part of the instructors involved in anchored instruction and confirms the suggestion by Baumbach, Brewer & Bird, (1995), that "with anchored instruction, the teacher can no longer follow a fully scripted lesson plan."

Providing on-demand learning. "On-demand learning allows the individual to learn the topics they need when they need" (Duke, 2000). It has been suggested that "people learn best when they can learn exactly what they need at exactly the moment they need it…" (Skillsoft, 2000). In this study the technology instructor provided on-demand learning on several occasions. An example was in the case of Inspirations as described above. At the beginning of the course, the technology instructor had not planned to use the Inspiration software. Upon attending the curriculum class sessions and watching the concept mapping session (using a chalkboard), she quickly recognized this as a very timely opportunity to introduce Inspiration as a concept mapping software. The preservice teachers then used inspiration to create an electronic version of the concept map which they had tried to create on the chalkboard earlier on in that day. Inspiration became the exact topic they needed to learn at this particular moment. Providing this on-demand learning helped the preservice teachers appreciate the use of Inspiration. As the ease of forming concept maps using Inspiration unfolded to them, the class was full of "aahhs" and "oohs" in appreciation.

One of the advantages of providing individuals with on-demand learning is that it allows "them to immediately apply their newly gained knowledge… Immediate application cements the knowledge gain and makes it far more likely that the knowledge will be retained and used in future" (Skillsoft, 2000). A number of preservice teachers in this study reported that they started using some of the applications such as Inspiration, PowerPoint, and KidPix for other courses as well.

Recognizing teachable moments. Closely related to the concept of providing on-demand learning is the need for instructors to recognize and seize teachable moments. Teachable moments refer to a time when individuals are ready to learn. In using this approach "the teacher may appropriately decide that the current discussion or situation may offer a prime opportunity to meet current or anticipated learning goals better than the planned instructional activities" (MentorNet domain, 2000). In this study, some time the technology instructor had to change a planned course of action in order to seize a teachable moment. The case of Inspiration above was one example. The prior plan for that particular class session was for the preservice teachers to work on completing previous assignments. The introduction of spreadsheet as a possible trip planning software, as described earlier, was another example. "Suitable recognition and capitalization of teachable moments can increase instructional efficiency, despite deviation from planned activities" (MentorNet domain, 2000).

Cohort group. Cohort instructional programs, where students are required to take all or nearly all courses together toward a degree, have been associated with some benefits. An example of these benefits includes higher levels of cohesiveness and group interaction among the students (Reynolds, 1993). These interactions in turn result in, enhanced professional confidence and life long learning relationships. This study reveals an additional advantage of cohort instructional programs, namely that cohort instructional programs present an excellent setting for educators to implement anchored instruction. The collaborative teaching experience in this study was made possible by the fact that the preservice teachers were involved in a cohort instructional program based on a partnership between the university and the local Junior high school.

Motivation. One major difference between this class and other similar classes that the technology instructor had taught before (based on same technological applications) was the level of enthusiasm and motivation in the preservice teachers. As she indicated "on average, for example, I spend considerable time just trying to get the students to think of a topic of interest to use when practicing web searching. In contrast, it seemed like this class could hardly wait to *lay their hands on the WWW*, because they were very eager to see how much information about coal and coal mining was available on the web".

The preservice teachers' perspective. At the end of the technology class the preservice teachers shared some of their reflections on the anchored instruction experience. These reflections highlight some of the benefits of this anchored instruction in their learning experience including: increased motivation to work on and complete tasks, a sense of pride and accomplishment, understanding of integration of technology in the curriculum, and developing a vision for integrating technology in their own classrooms. Some of these benefits are captured in the following excerpts from the students' reflection papers.

> *"It was because I was involved in this unique integrated curriculum that makes it easy or me to envision technology in my own classroom."*
>
> *"This integrated experience has made learning to use technology effectively all the more meaningful."*
>
> *"I found myself practically bragging to other technology student [not involved in the anchored instruction partnership] throughout the quarter about how our class made so much more sense because we were connecting our classes together."*
>
> *"The integration of these two classes really helped me to be a reflective educator."*

Summary, conclusions and suggestions

A cohort group of preservice teachers was immersed in a hand-on experience where the preservice teachers learned the use of technology applications within a real life setting. The theme, content, and activities of a curriculum development class were used as an anchor for the preservice teachers to learn the use and integration of technology applications in teaching and learning. Planning the activities around the anchor in such a way as to fit the activities within the curriculum called for flexibility in the part of the instructor. By recognizing and seizing teachable moments the instructor provided on demand learning which led to transfer of skills to other areas. Anchored instruction was found to be an effective way of training preservice teachers to develop a vision for integrating technology in the curriculum. It also resulted in increased motivation to work on and complete tasks, a sense of pride and accomplishment, and understanding of integration of technology in the curriculum.

One of the unique situations that made this collaborative partnership possible was the fact that the preservice teachers were in a cohort group. Cohort groups of preservice teachers therefore present an excellent opportunity for implementing anchored instruction. Where cohort groups of preservice teachers can be organized, technology instructors should take advantage of such a setting and create collaborative partnerships that would allow the activities of an educational computing course to be anchored around the theme, content, and activities of another course.

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Challenges to Currency in the Educational Computing Course

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Abstract: This short paper is an initial report on the challenges facing the instructor of the educational computing course as colleges and universities strive to prepare technology-capable teachers who in turn can produce technology-capable students. These challenges include the changes in entry-level computing skills for preservice teachers, along with the many new innovations in hardware, software, and course delivery tools. These dramatic changes pose wonderful opportunities and demanding challenges for the instructor of the educational computing course and for teacher education programs.

Introduction

A major goal of teacher education is to prepare teachers to play a vital role in preparing students to function in a technology-rich environment. The International Society for Technology in Education document, *National Educational Technology Standards for Teachers*, states that "Our educational system must produce technology-capable kids." Colleges and universities have the responsibility for producing technology-capable teachers. A major challenge to the instructor of the educational computing course and to teacher education programs is maintaining currency, and even innovation, in a course that must constantly change. This is not an easy challenge. Pre-service teachers' entry-level computing skills have improved substantially over the past few years, hardware as well as software is being updated and replaced at a rapid rate, instructional delivery tools are constantly being developed and modified, and the expected skill-level for teachers is approaching higher standards. These dramatic changes pose wonderful opportunities and demanding challenges for the educational computing course and for teacher education programs.

Entry-Level Computing Skills

Information collected from a survey of students entering an educational computing class in 1995, and a comparable survey in 2000, demonstrates the change in skills of incoming students. Less than five years ago, most students entered college with few computing skills. These skills were mostly restricted to the use of word-processing or spreadsheet applications. Today's students arrive in the college classroom with an array of computing skills and some savvy experience in using technology. These same students usually carry cellular phones, must have an e-mail fix every few hours, and have access to a computer outside of the university lab or classroom. Before students arrive on campus, many have listened to music via the web, played with an array of interactive game software, downloaded plug-ins, and participated in chat-rooms. These students also bring an expectation to the computing classroom for more than a sampling of presentation software, database applications, and web development. As teacher educators, we must continually assess the skill-level and knowledge of our incoming students and strive to update course curriculum and activities to meet the needs of our pre-service teachers and the students whom they will teach. With computers in most homes and students arriving at college with more experience in computer use (*Digest of Educational Statistics*, 1999), it is vital that the educational computing course take into account these significant improvements in students' entry-level skills. As a result, the instructor of the educational computing course must continually examine the curriculum, throw out the obsolete and replace it with new applications and skills. These skills must be blended with the appropriate focus on activities

which will allow pre-service teachers to gain the design and delivery experiences needed for classrooms which will produce "technology-capable kids."

Changes in Hardware and Software

In early 1995 there was no need to assess student skills in using the web or to teach students about web design. Although the Internet was in existence in the late 1960's (Shelly, Cashman, & Gunter), prolific creation of web sites and use of the web for education have only exploded during the past few years. Today's entry-level students are adept at searching for information on the web and are beginning to be much more experienced in creating web pages. Yesterday's web creation lessons for the educational computing class, which included some basic activities using HTML or Netscape Composer, are not sufficient for today's students. Students can now expect to use a variety of packages, such as Macromedia's Dreamweaver 3.0 or Microsoft's FrontPage 2000, to develop professional web sites and web pages. It is a major challenge for an instructor to maintain currency in the various web-development and graphics-applications packages and provide appropriate learning experiences for our students. Presentation software has also moved from simple screen designs with text and clip art to complex learning kiosks with interactive buttons, digital video and audio, and complex designs that allow the user to view only certain portions of the materials and not just a sequential show. It is no longer a question of which button to add but rather how does one design an on-line learning module which encourages higher-order thinking skills. The teacher educator must possess skills in using digital cameras, digital video cameras, scanners, and know how to use appropriate software to capture and edit the products of these peripherals into viable electronic objects for learning. Computers must constantly be replaced with those having faster processors, more memory, and special cards for all of these powerful new tools. The average life expectancy of a computer in a college lab or in a public school classroom is less than two years and the average life expectancy of a course syllabus for the instructional computing course is barely one semester. Curricular revision, combined with changes in hardware and software, adds to the challenges facing the instructor of the educational computing course and these are not the only elements of change. Perhaps the greatest element of change comes from the challenges placed on new methods of course delivery.

Changing Delivery Methods

Classroom face-to-face interaction is sometimes being replaced, or at least challenged, by courses which are totally or partially on-line. Pre-service teachers may be experiencing these new learning environments in classes as well as studying appropriate ways for using these new tools. The instructor of the educational computing course must learn this new technology and also learn how to use this new technology to create dynamic learning environments that are very different from the four walls and blackboards used a few years ago. By the time an instructor masters the basic skills of a new package, such as WEBCT or Blackboard, the instructor finds that there is an updated version on the market--one that has more bells and whistles and holds the promise of a more effective learning environment with a shorter learning curve.

Future

How does the instructor of the educational computing course address these challenges posed by new entry-level computing skills of students, modifications of hardware and software, and new delivery techniques? The instructor of the educational computing course is also a learner. Consequently this learner heads back to the classroom in whatever form that classroom currently exists, either face-to-face, on-line, or wireless, to learn new applications or upgrades that will hopefully make the classroom of the future a better place to learn and the teacher a more effective facilitator of learning. If a major goal of education is to produce lifelong learners, then the instructor in the educational computing course makes an excellent model. This instructor probably learns something new regarding educational technology every day and enjoys almost every challenging minute of the experience.

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Architecture of a Cooperative Hypermedia

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Abstract: Cooperation is one of the most important human activities. Several researchers over the world showed that cooperation enhance learning. Cooperative learning is very imoprtant because it produces greater student achievement.In this paper, we present the architecture of an environment based hypermedia that supports cooperation between learners. We present also its implementation.

1. Introduction :

The application of cooperation principles in hypermedia environment is not a new idea. Many researchers had prouved that providing cooperation opportunities to learners can reduce the problems of hypermedia, i.e. the lost in the hyperespace and the cognitive overloading.
In this paper, we present a architecture of an hypremedia that offers cooperation opportunities to learners.

2. Architecture of the system:

This hypermedia is composed of a set of human-machine interfaces, a tutor and some others modules.

2.1. Student interface:

It is through this interface that the learner navigates, request advices from the tutor or cooperate with their peers. Learners can exchange ideas, some points of view, suggestions, ... a s.o. A dialogue model is under construction in order to facilitate the negociation beteween learners.

2.2. Author interface:

The author creates the hypermedia (nodes, links, ..). The matter to be learned is divided into a set of educational objectives. So, the hypermedia contain a set of educational objectives related by «prerequest» relation. Each educational objective is represented by a set of nodes, so, two objectives can have the same node. For each objective, the author creates:

- the nodes of this objective,
- the « prerequest » objectives,
- the difficulty level.

For evaluate the student's knowledge, the author creates exercices with their solutions and the score to add or to substract.

2.3. Tutor:

It is used in order to propose an educational objective to the learner following the student's knowledge state. It can give advices to learners or informations about the cooperation opportunities (Lafifi &

Bensebaa 2000). It uses a set of pedagogic strategies which are constituted by a set of pedagogic rules. Theses rules have the shape of a production rule:

If Condition Then Action

3. Implementation and conclusion:

For implementing this architecture, we had used a Server/Client architecture. In the Server slide, we have the hypermedia, the tutor and the author interface.
In other hand, in the client side, we have a student interface, the student model of each student and its historic. For accessing in each interface, a passoword is used.

We presented the main features of the architecture of an hypermedia system that can offer cooperation possibilities to learners. Now, we try to implement this architecture in the Web.

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Freeing the Monkeys:
Making the EdTech Course More than Learning to Push Buttons

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Abstract: Since 1995, the School of Education at American University has offered a course called Educational Uses of Technology. The aim of the class has been to teach the metaskills necessary to empower students to become self-directed learners capable of mastering new computer skills on their own. The course attempts to accomplish this through the use of tutorials and limited group projects. This study solicited feedback from former students who successfully completed the course. Most of the respondents reported that they had become more comfortable with learning new computer applications as a result of taking the course. The authors feel these results provide support for the teaching methods used.

Introduction

Several years ago I got a hair cut at one of the big franchised haircutting establishments. When I went to pay, the stylist had a problem with the computer that served as a register. The screen locked up, and she did not know what to do. After watching her stare timidly at the screen for several minutes, I offered to help. A quick reboot later I was able to pay for my haircut. The very next day I was buying a cup of coffee in a college cafeteria when the same sort of computer problem confronted the woman working the register. Instead of staring helplessly at her machine, this woman prodded a number of keys before shrugging and rebooting the computer. The moral of this tale is not that I could have gotten out of paying for a haircut if I had just kept my mouth shut. What really struck me was the difference between the ways these two women dealt with their computers. The first woman was clearly apprehensive about the machine and too nervous to try anything when it stopped working. The second woman was much more comfortable with her machine and thought nothing of doing a little experimenting to get it to work.

Semester after semester we see students in educational technology classes who approach computers with the same trepidation as the hair stylist in this story (Kay, 1989). If we are really going to give them what they need out of an educational technology course, we need to be able to help them become more like the second woman in the story. They have to be willing and able to try things for themselves.

If you stand outside any software training class and listen, you are most likely to hear the instructor walking students step-by-step through the procedure of some operation of whatever application is being taught. "Click the File Menu. Scroll down to Page Setup and click it. Choose the Paper Size tab. Click the Landscape option in the Orientation section." Voila! You have instructed the printer to print down the length instead of across the width of the page. But did anyone learn anything from the process? In today's climate of appreciation for learning by doing and degradation of simple memorization, this type of rote drill is to be discouraged (Bird, 1993).

In 1991, I had a job travelling around the country teaching seminars on how to repair and upgrade computers. One day the own of the company really lost his patience with me because I complained that I did not understand some aspects of the new course well enough to teach them after sitting in on the course twice. In a fit of anger he yelled, "a trained monkey could have learned it by now." Needless to say, I was not working for the same company the next day. But the expression stuck with me and it has come to be

the way I think of courses that focus on memorizing which buttons to push. If our educational technology courses are not doing more than teaching which buttons to push, we might just as well be working with trained monkeys. We believe that would both waste our time and annoy the monkeys. So we are trying to free the monkeys and make our educational technology courses more than just button pushing seminar.

A major element of our approach has been the use of tutorials. Instead of walking students through a new application step by step, we encourage them to read and follow a tutorial. This guides student away from passive learning and toward self-paced, active learning (Zemelman and Daniels, 1998). When they encounter trouble, we help them get back on track, but mostly the instructor serves as reassurance. Students with problems are gently urged to try to solve their own problems while the instructor guides their problem solving effort. This is a form of Piaget's (1995) scaffolding. The student without enough experience to come up with the solution immediately is helped to reach a solution they can call their own. The sense of personal accomplishment in this system is much higher than in a system based on pushing buttons on cue. So is the level of frustration along the way. Instructors must be prepared to deal with that frustration and hold on to the belief that student satisfaction with their own accomplishments will be all the higher for it.

The Study

What we have been seeking to do is foster the metaskills necessary to empower our students to become independent, self-guided learners in the area of educational technology. While we use a variety of active learning techniques to foster this in our education technology classes, we have had little feedback concerning the success of our efforts. To change that, we assembled a database of all of the students who have completed the Educational Uses of Technology course offered by American University's School of Education since 1995. Because the course is offer both to undergraduate and graduate students, many of those who completed it in its early history have left the university. We were not able to contact all of the former students. Of the 312 students who have completed the course, we were only able to successfully contact 205. Most of this group was recruited to participate in an email survey for this study. Twenty-one others were contacted and agreed to participate either through conventional mail, telephone or (in two cases) personal interviews. Of the 205 students agreeing to participate, only 93 had actually responded by the writing of this paper.

All participants were asked to respond to a questionnaire containing ten queries. Because we have a number of records giving individuals self-reported attitudes and experiences concerning educational uses of technology from their time in class, we chose not to make this an anonymous process. We also asked the participants to report in which semester and with which instructor they took the course so that we might compare responses to the questionnaire to past student evaluations.

The questions addressed to the participants fell into two main categories. Four questions solicited the former students' impressions of the usefulness of the material they learned while taking the Educational Uses of Technology course. Four questions asked about the former students' experiences with computers since completing the course. The remaining two questions asked for recommendations to improve the quality of the course. All of the questions were open-ended, and participants were encouraged to make their responses as detailed and lengthy as they wished.

Findings

Of those who responded, 85 said they felt that the Educational Uses of Technology course had been beneficial. Seven of the remaining eight respondents said they did not learn anything new in the class while the eighth felt "*the class was a stupid waste of time.*" This former student went on to say that he thought, "*the class shouldn't be required for people who already know how to use computers.*" Of those with more positive assessments, many mentioned that the course helped them *feel "more comfortable about using computers."*

Twenty-three percent of respondents reported learning to use new software or peripheral devices since taking the course. Of those who were more explicit in their answers, twelve wrote that they had learned to use at least one new software application. Four participants said they had used more than one new package. Two reported learning to use a scanner on their own (as opposed to with the assistance of a

lab assistant while taking the course). One excited former student was the proud owner of a new web cam and wrote that it was "*really cool.*"

Most (86%) of the participants reported that they had used specific skills that had been taught in the Educational Uses of Technology class since completing the course. Forty-two said they had created or presented power point presentations. Twenty respondents wrote that they had created web pages for themselves or for groups or projects with which they were associated. Eighteen said they had used specific skills learned in class but failed to mention which skills those were. No respondents reported designing their own learning labs since completing the final class project. Two students volunteered that the course helped them make decisions when buying a new computer.

Interestingly, only 38% of respondents reported remembering having felt any anxiety related to computers before they took the course. Yet on average, slightly more than half of the students who take the Educational Uses of Technology course report some level of anxiety about using computers in the beginning of the class. Of those who reported remembering having felt anxiety, all said that the course lessened the level of tension they felt when dealing with computers. Most seemed to indicate that they now felt little or no apprehension, but twelve (13%) reported that they still felt some such anxiety. It was unclear from the responses how many meant they constantly felt apprehensive as opposed to periodically experiencing tension. One respondent wrote, "*I usually am okay with the computer now. But some days everything seems to go wrong and I get so I just want to throw it out the window.*" Since this student responded to the survey via email, we assume she has not yet given into that urge.

When asked about confidence in their ability to use skills specifically learned in class, 84% of participants said they could currently use or relearn those skills on their own. Several respondents made comments similar to one former student who wrote, "*I guess I could make a web page on my own if I had to, but it would be easier if you were there. I'd be more confident just knowing I could ask for help if I had to.*"

When asked about confidence in their ability to learn new computer based skills on their own, 61% of respondents reported that they either had done so or thought they could do so. It is worth noting that of the 57 participants, who answered in the affirmative, nearly half went on to mention having someone they could turn to for help or advice. We are divided on the issue of whether or not this counts as being able to learn new software "*on your own.*"

Eighteen participants said they felt more courses on the educational uses of technology ought to be required or at least available though American University's School of Education. One student specifically stated that the current course should not be required of education majors and graduate students.

A disappointingly small number of former students are currently teaching using any form of computer technology. Of the twenty-eight respondents who are currently teaching, only twelve reported having working computers available to them in school. Of those twelve, none reported having more than a handful of computers in their classrooms. One particularly passionate student wrote, "*It's not fair. I learned how to do all this neat stuff getting my degree, but I can't use any of it. I only have four computers in my classroom and they are so old they won't run anything I can buy today. If they were even working.*" Two respondents did report having class web pages where they posted scanned copies of students' work for parents to see online. Several participants reported using email to communicate with parents. By and large, however, most did not seem to have access to the computing resources the course prepared them to use.

Conclusions

There is a natural tension between the desires of students to develop specific and explicit skills in a class such as Educational Uses of Technology and the instructional goal of helping students develop the metaskills discussed above. The majority of students taking such a class are pre-service teachers. According to Fullers (1974) Teacher Concerns Model they are primarily focussed on developing basic skills. As the dreaded "*will this be on the test*" question indicates, many students feel they only have time to master skills and knowledge on which they will be graded. The metaskills for independent mastery of new computer skills are not easily tested for in a single semester. It is natural, therefore, for students to want to be taught new computing skills in the traditional rote button-pressing manner that we have called monkey work. Despite that urge, almost two-thirds of our former students indirectly reported having developed the ability to teach themselves new computer applications. Given that more than half of all

students starting the course indicate that they would have difficulty doing so, we find reason to believe that we have been at least partially successful in our goal of fostering the desired metaskills.

Lewis (1988) made a number of recommendations for easing anxieties about computers in education classes. Among them were relating personal experiences as a beginning computer user to relax students and make them more comfortable in the early stages of their technical skill development. We recommend creating a classroom environment that is relaxed, comfortable and informal. For many students there will be considerable tension when trying to do new things on a computer. The instructor needs to do everything possible to minimize other sources of tension. Ideally students need to develop a sort of fearless willingness to try new things. They need to know that it is okay to fail and make mistakes when learning new skills. Piaget (1995) suggested that each time humans try to learn a new set of skills that are essentially going through the stages of mental development on a micro scale. To individuals used to working in familiar areas this can be a very daunting experience. A number of participants remarked that the casual classroom atmosphere of the Educational Uses of Technology course made the experience much more pleasant.

To help minimize frustration, Konar, Kraut and Wong (1986) recommended starting with simple tasks early and working up to more difficult tasks later in the semester. This may seem obvious when it is mentioned, but many instructors do not seem to take it into consideration when laying out educational technology courses. We start off at the simplest level of sending email, web browsing and using a search engine. Mastery of these simple tasks helps to build confidence and starts students with a foundation of success. By the end of the semester, students are able to plan and design their own computer based learning labs complete with promotional web pages and explanatory power point presentations.

We cannot emphasize enough the need for this type of class to be a hands-on, active learning environment. It is not enough just to have students sitting at computers. The monkey work approach does that. Students need to be active participants in the learning process. We foster this with the use of tutorials and several group projects. The instructor needs to step back to a support role and resist the urge to explain every step in detail. A good overview of what needs to be done and how the tutorial will guide the process is enough. After that, answering individual questions while everyone is working is the best approach. The instructor should encourage exploration and problem solving by the students. Giving a prompt answer to every question may be tempting, but students will get more out of the process if they are encouraged to work through difficulties.

This study was originally intended as a way to get feedback from former students beyond the traditional end of semester student evaluation. Overall, most of our former students seemed pleased with both the content and the structure of the course. A few suggestions were made about changing the order or assignments and a couple of students even suggested adding more assignments. We will be experiment with these ideas in coming semesters. We find support for our pedagogical approach in the survey responses. We intend to continue soliciting feedback from students from current and future classes. We also intend to carry on freeing the monkeys.

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"Surfing Safely with Social Navigation"

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This proposal relates to the use of instructional technology in undergraduate and graduate teacher education. It fits the topics of: The Educational Computing Course; Graduate & Inservice Education; Instructional Design; Preservice Teacher Education; Technology Diffusion; and Telecommunications.

Many parents and teachers are concerned about the growing proliferation of published material on the World Wide Web, some of it being unfit for small children's eyes and minds. Thousands of new websites are being added every month to the Internet with a wide range of HTML styles and structures. Navigating this vast sea of information safely becomes a nightmarish adventure for the uninformed and/or uninitiated.

Dieberger (1997) proposes that when Internet users help each other with this navigational task, they are using "Social Navigation." Often users will e-mail each other URLs with descriptions of the websites and recommendations. Or they might create a webpage with pointers to their favorite and/or most helpful sites. When the recipients and readers use these resources, whether via e-mail or the webpage, they are engaging in a social activity while surfing the web.

Dieberger (1997) recommends direct social navigation where a group of individuals with common interests agree to share ideas, resources, and evaluations. These recommendations become a point of discussion as others view the selected Internet resource, evaluate the site for themselves, and compare and contrast their own evaluations of the site.

Undergraduate and graduate education students at the author's current university have been involved in Social Navigation for the past few semesters in an organized manner. This has lead to more and varied integration of educational technology into the School of Education's courses and into the actual teaching of the courses by the established faculty. It has also encouraged the faculty to experiment with new technology and explore the multiplicity of offerings on the WWW.

For example, Education Strategies students, under the direction of their instructors, are now required to do web-based research on available on-line resources for their discipline as part of a lesson plan. With the technical guidance and instruction of the author, each student researches a minimum of four websites and composes an HTML document containing the name of each site, its URL, and an annotation of the webpage. The web-based lesson plan is then edited, as necessary, by the webmaster and uploaded onto the School of Education's server for viewing through the World Wide Web at http://teach.fhu.edu/technology/.

Other undergraduate and graduate courses are also involved in web research and webpage design, although to a lesser extent than the Education Strategies classes. For example, some of the introductory Special Education classes have created webpages featuring specific learning disabilities and handicapping conditions. These are hosted on the School of Education's website, as well.

The author's graduate students in EDU 506, Computer Applications in Education, have not only created webpages with Internet resources, but have also been involved in e-mailing their instructor and fellow class members. They are providing thoroughly reviewed and evaluated, hand-picked lists of URLs to other websites of interest to K-12 teachers. Dieberger (1997) argues that the locations of social navigation are important and therefore our class provides a supportive atmosphere to both explore the web and share found resources in a collaborative environment. Creating e-mail discussions that represent different interpretations reinforces an advanced state of cognitive functioning.

Collaborative Communities Think About Technology in Education: a Web-based Constructivist Course Model for Pre-service Teachers.

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Abstract: A need exists for beginning teachers to be aware of ways in which technology can be integrated into classroom instruction. This paper is a reflection on a course model that was developed to address this need. The course is available to students in a one-year post-degree education program. It focuses on the use of technology in education and is designed in a manner that encourages reflection and engagement. The students collaborate in theoretical and practical readings, field experiences and instructional design. Students in the course actively engage in the construction of their knowledge as part of a community of learners.

Introduction

That all pre-service teachers acknowledge and become familiar with the use of technology in public school classrooms is widely accepted. Acknowledging this need, pre-service teachers in our university's intensive one-year post degree program are required to take an introduction to technology and instructional design course in the first term. In the second term they may also take an optional course, *Technology in Education*. The model for this course has evolved over the past few years. It focuses on the process of technology use in education. This focus on process requires of the pre-service teachers theoretical investigation and the sharing of thoughts on readings, experiences, and on the rationales that have been generated for the use of technology in schools as well as in the broader community.

The course model is one structured around collaborative investigation and constructivist pedagogy. Most of the course time is spent reading in the library, working on collaborative projects, conducting field investigations and discussing and reacting to what is being read, experienced, observed and/or discovered. The pre-service teachers are active group participants in helping to shape each other's understandings of technology. They also are members of focused discussion and research groups. As part of a learning community they collaborate by sharing thoughts and engaging in a dialogue through written texts and oral communication. This dialogue of engagement both oral and textual is often at a level of sophistication and deep understanding that I have not experienced through a more traditional course structure. The course consists of a study of three distinct areas: theory and practice surrounding technology use, learning from and through experience, and the design of a web-based project that could be used in the public school system.

Course Structure

The course structure requires the pre-service teacher to have a series of linked web pages on which they share what they have come to believe about technology use in education and to which class members react and respond. Students read about issues that are related to visions and rationales for the use of technology in education and respond to these readings on web-based Read Log pages. Students in the course are involved at the same time in reacting to their classmates writing and responding on the Read Log pages. This external dialogue enables shared understandings of the place of technology in public school education.

The second phase of the course is allocated for the actual process of learning about technology use in

schools. The pre-service teachers spend one-third of the course in a school based technology setting. This engages students in a process that, like all learning, involves *doing* as well as *getting*. The objective of this component of the course is to use a community or public service experience to enhance and impact the learning of traditional course content. This component of the course provides an opportunity to *test* or *demonstrate* abstract theory in the real world. The pre-service teachers share the knowledge they have gained from their visits to schools through a reflective web page.

The development of a web-based design for instruction is the final component of the course. The instructional design reflects the pre-service teacher's previous course work giving them a sense of the theoretical as well as the practical implications for the use of technology. The creation of the instructional design is completed as part of a team. The team often focuses on a topic within a discipline but in some cases the designs are interdisciplinary in approach. The instructional design topic is most often developed around particular areas of interest and has ranged from a study of environmental biology to the study of fairy tales in elementary language arts. Teams of pre-service teachers collaborate on the web-based instructional design package by working together— teaching and learning together.

Findings

In the first phase of the course model discussions around theoretical and practical readings are not instructor focused or directed. The opportunity exists for all students to express their views through their web pages. In traditional fifty-minute classes discussion usually occurs among a small group of vocal students; others are reluctant to enter the debate/discussion and they often remain silent. Through interactive web pages all class members have the opportunity to express their views and when the class meets as a whole everyone is familiar with each other's perspective and a more focused dialogue occurs.

The degree of engagement in a textual dialogue are sampled here in some responses from a Read Log page, "I am very interested in examining this article in full, …I am uncertain of the direction K—[female] is aiming for in her response? Is she suggesting that the role of the public school teachers should move in the direction of caretaker, not educator? …Granted widespread computer use will help in sharing of knowledge as well as accessing knowledge, but who will be there to filter this new knowledge?" Responding to this, "E—[male]: You have some valid questions, … First of all I do advocate the use of computers in the schools. I see technology 'know how' as a marketable skill in the workforce and feel those who do not have any ultimately reduce their options." The opportunities for students to share their views in a public forum enhances the understandings of the class as a whole and serves to extend the dialogue beyond the privacy of student essays and teacher responses.

Field placement experiences occur in public schools that have been identified as exemplary users of technology. The pre-service teachers are encouraged to think of themselves as active participants who may be called upon to share their knowledge. They were often impressed by what they saw, "It's amazing to think that grade five and six students were producing this work!" while others were positively reinforced by the teaching experience, "They asked lots of questions that I knew the answers to and that made me feel important." Coming to an understanding of theoretical views and then experiencing the practical realities of the public school classrooms serves as vital information and experience for the final stage of the course which is the design of a web-based instructional learning package.

Conclusion

This course model focuses on helping pre-service teachers think about how they learn and how they can improve learning as well as how they can learn from one another. The course tasks have a *real* educational purpose and are not usually done for the sake of completing an assignment. Students construct activities or representations of their understanding; particularly in their electronic course web pages, which reflect their experiences and thought developments as well as a finished product. The course design supports a constructivist model of instruction, which creates an environment that has learners construct understandings of the use of technology in public education.

Revising an educational computing course to meet the National Educational Technology Standards: A process of reflective teaching.

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Abstract: In our attempt to address National Educational Technology Standards (NETS) set forth by the International Society for Technology in Education (ISTE), we have faced issues impacting the conditions of learning experienced by our students. As reflective practitioners, we have revisited the curriculum to make improvements based on our experiences and our students' experiences in the required educational computing course in our college of education. Our reflections have included conversations about the scope and sequence of the curriculum, pedagogical knowledge, instructional strategies, and procedures for assessment. This paper will highlight key points of our discussions and describe interventions and their resulting consequences for our preservice teachers.

Introduction

Teacher preparation is a key factor to consider when determining beginning teachers' use of technology for instructional purposes. Most colleges of education offer a required educational computing course for all preservice teachers. This introductory course generally covers basic skills and computer operations, and attempts to provide students with familiarity with a range of technological applications such as word processing, databases, spreadsheets, telecommunications, multimedia/hypermedia and content related software. Until appropriate uses of technology are fully integrated throughout the entire teacher preparation program, a separate instructional technology course will continue to be a necessary core requirement.

At the College of Education at the University of Tennessee (UT), *ITCE 486: Introduction to Instructional Computing* fulfills this basic computer requirement for all teacher education students. Admission to the teacher education program is the only requirement, although this has not been strictly enforced in past semesters. Eighty students enrolled in one of six sections during the Fall '00 semester. Three Instructional Technology (IT) faculty members taught four of the sections while the remaining sections were taught by graduate teaching associates. While two of the IT faculty members were beginning their first semester at UT, both had previously taught similar courses at other universities.

Dewey's contributions to reflective teaching have provided an avenue for thinking about and discussing revisions to create a positive impact on students' learning about and with technology. According to Dewey, "the process of reflection for teachers begins when they experience a difficulty, troublesome event, or experience that cannot be immediately resolved" (Zeichner & Liston, 1996). Throughout the course of the semester, while we experienced success stories in various sections, we also faced numerous challenges encouraging us to engage in this process of reflection. We (course instructors) met on a regular basis during the semester to discuss issues, concerns, instructional strategies, and plans for future improvements. These conversations enhanced understanding of how the history and purpose of the course had an impact on the current situation. Using information gathered from the

overall situation, reflective practitioners construct the problem and use their knowledge of experiences to make changes grounded in a contextual understanding of the problem. Our attempts to act as reflective practitioners and were carried beyond formal meetings as we continued to discuss course related issues and the larger role of technology in the College of Education in numerous informal meetings throughout the semester.

Using this framework as a guide, we have reflected on our experiences and the experiences of our students with an educational computing course, and revisited the curriculum to make improvements based on what we have learned. Our reflections have included conversations about the scope and sequence of the curriculum, pedagogical knowledge, instructional strategies, and procedures for assessment.

Areas for Consideration

Scope and Sequence of the Curriculum:

One of our major course changes focused on aligning our course goals to the National Educational Technology Standards (NETS). The International Society for Technology in Education (ISTE) NETS for Teachers Project has put together a series of Performance Profiles for teacher preparation, describing what teachers should know about and be able to do with technology. The Performance Profiles address four phases that a typical teacher education student might experience: General Preparation, Professional Preparation, Student Teaching/Internship, and First-Year Teaching (ISTE, 2000). Based on our class composition, we focused on the profile targeting the professional preparation experience. To further support our emphasis on these standards, we adopted a resource book from the NETS project[1] which provided students with examples and lessons based on the standards.

Our biggest challenge in this area was the sheer number of topics we felt compelled to introduce, given the fact that this course served as the only exposure to instructional technology for the majority of students. The curriculum included topics from a variety of general areas including word processing, databases, spreadsheets, telecommunications, multimedia/hypermedia and content related software. At the beginning of the semester, course instructors agreed on basic areas, but depth of coverage, timing of topics, and required assignments varied from section to section. While consistency in major course topics was necessary, we maintained the need for flexibility in implementation. This provided instructors with opportunities to target instruction based on their teaching styles and the needs of their unique sections. For example, although all sections were to learn to create instructional Web pages, one section might have created WebQuests while another section might have been asked to create online portfolios. The differences in skills and assignments were enough to warrant a lengthy discussion about the need for greater consistency within topics. We wanted to bring about some level of consistency and accountability among sections so that *all* students learn a common body of knowledge regardless of the section in which they are enrolled. Dividing up core topics, each instructor compiled a list of basic and advanced competencies that were modified by the group until consensus was reached. These competencies will be included in future student course packets. With this in place, other courses in the teacher preparation program can build on the foundation this course provides.

Pedagogical Knowledge

Most of the course instructors shared the philosophy that technology should not be taught in isolation, but should be tied into the curriculum. Since the majority of our students were just entering the teacher preparation program and had not taken any methods courses, they were unfamiliar with the profession of teaching aside from their own personal experiences from their perspective as a student in a K-12 classroom. As a group, we made a decision to introduce them to the state content standards—the Tennessee Curriculum Frameworks—and the national educational technology standards. We also felt it necessary to introduce the components of a basic lesson plan so students could begin to make connections in planning and designing an instructionally sound, technology-rich lesson or series of lessons. We sacrificed the time consumed by these activities that would otherwise have been spent on regular course topics, but we felt it provided students with a critical foundation to help them focus on technology as a tool to support teaching and learning in a K-12 classroom. Students were expected to connect the competencies they were learning to a curricular area and grade level of their choice.

Students' lack of pedagogical knowledge at this point of their program was evident in the initial lessons produced. Many struggled with trying to learn a new technology skill as well as address issues such as assessment,

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[1] National Educational Technology Standards for Students: Connecting Curriculum and Technology. Published by the International Society for Technology in Education, 2000.

lesson planning, unit organization, and creating developmentally appropriate classroom activities. Midway into the semester, a faculty member created a structured, yet simplified electronic lesson plan for students to use as an initial template. This provided an important level of scaffolding as it helped students focus on the basic components of a lesson plan and articulate their thoughts in an organized and concise manner. We plan to provide students with this electronic template at the beginning of the semester along with examples of clearly written lesson plans that include meaningful uses of technology. Due to the time constraints, we have found it necessary to reduce the number of formal lesson plans needed for each technology competency area so students can concentrate on the quality and not the quantity of their written assignments.

Instructional Strategies

The strong emphasis on curriculum connections created special challenges in finding examples that were relevant to students within each section. Overall, 43% of the students were majoring in elementary education, 29% in secondary education (history, english, math, science, foreign language, agricultural education), 10% in special education, 10% in music education, and the remaining 8% came from deaf education, early childhood, and recreation studies). Each section was comprised of students from different areas, making it difficult to find examples of content-based technology applications relevant to all students. Similarly, all students used the same software, regardless of whether or not it was most appropriate for their grade level or subject are. For example, Kid Pix would have been a better choice for demonstrating how one might use slideshows with very young children, yet PowerPoint was selected as we felt that this tool would be relevant to the majority of the students. While our course packet consisted of practical articles that described uses of technology, it would have been costly to include examples representative of every grade level and content area. To address this need, we plan to build an organized resource file from which individual instructors can pull out articles based on specific student interests in addition to linking to online lesson databases or activities. These resources will provide students with opportunities to examine models in order to get ideas for adapting existing activities or developing their own ideas.

Archives of student projects provide another rich source for learning about applying technology to achieve sound instructional objectives. Students' course packets include an authorization form they can voluntarily complete if they would like course instructors to share their work with a wider audience. We feel that student examples provide a realistic picture of what others, who share similar experiences, are able to accomplish. By showing a variety of well-executed projects created by novice to advanced users, students get a sense of what can be done without feeling overwhelmed by perceptions of unrealistic expectations. By combining and organizing student projects among sections, we plan to build a growing archive containing projects and lesson plans demonstrating technology applications across a wide range of areas.

Another major area for improvement focuses on *modeling* instructional strategies that effective teachers themselves may use in a classroom. While the basic format of each class consists of direct instruction, demonstrations and hands-on lab time for project development, we feel that various models of teaching need to be implemented and articulated so that students begin to recognize, understand, and therefore use these strategies in their own classrooms. For example, instead of lecturing about Copyright and Fair Use Guidelines, we can embed case scenarios for analysis by small groups, thereby modeling the use of teaching cases and the need to make connections to real world events. Time, once again, hinders our ambition to accomplish everything in one class, but much can be done to change the manner in which we model effective and varied teaching strategies with our students.

Procedures for Assessment

The fourth standard in the NETS document addresses the ability for teachers to "apply technology to facilitate a variety of effective assessment and evaluation strategies" (ISTE, 2000). Since many students were just beginning their teacher preparation program, they had not taken any assessment classes. As a result, many were unfamiliar with this area and struggled to identify appropriate assessment strategies. In many cases, preservice teachers were asked to create samples of K-12 student products as an example of how their students might demonstrate knowledge about a subject. The projects had to tie in to instructional objectives as specified in their lesson plans. As a result of this project-based approach, we introduced the notion of using rubrics as a performance-based assessment to our students.

We modeled the use of rubrics by assessing most of our students' projects with various rubrics that we had designed. In the beginning, different section instructors created their own rubrics. This became a topic of discussion among the course instructors and an important decision was made to use a standards set of rubrics. One point of discussion about the initial rubric was the concern that students might have a tendency to use the guide as a checklist for quality. If the rubric was too vague though, then students might not apply all of the necessary project elements. If the rubric was too specific, however, we realized that students might be fulfill all of the individual areas, yet not achieve a quality project as a whole. Eventually, we found a way to combine elements of both the checklist and the holistic evaluation, allowing us to evaluate the entire project in a way that allowed us flexibility and provided students with adequate feedback about specific parts of the project that were well done or that needed improvement.

We are aware of the "law of the hammer" and are wary that students may use rubrics as an assessment tool for all tasks without considering alternatives that may be more appropriate. One of our goals for the future is to embed various types of assessment options at different points throughout the semester so students develop an awareness for connecting a task to an appropriate assessment strategy.

Currently, we require students to complete a paper-based technology portfolio of instructional applications of educational technologies based on the competencies completed as part of the course. An important part of the portfolio process is to document the development of skills and knowledge through a process of self-reflection. We are considering the possibility of offering an option to develop an online electronic portfolio and we are currently piloting this activity in one section to evaluate the feasibility of this option for the wider group.

Conclusions

While the separate introductory course model for preservice teachers is widespread, numerous problems are inherent with the structure of this type of course, especially when it serves as the only exposure to the use of technology as a learning and teaching tool in a teacher preparation program. Oftentimes, more than a year might pass between the introductory course offering and a student's field placement. Unless preservice teachers have a reason to use and practice technology related skills throughout their program, many will not feel comfortable using technology in their classrooms. Teacher education students have a better chance to achieve the National Educational Technology Standards if effective uses of technology are implemented and expected to be demonstrated throughout all phases of a teacher education program.

The possibilities are encouraging. One student, who concurrently enrolled in the introductory course during his internship year, reported that he was applying what he was learning and using the projects he developed in his middle school classroom placement. While he reported that it was not the ideal time for such an experience as he struggled to learn new technologies, complete class projects, and teach, his experiences demonstrate that timing and exposure are essential considerations. We believe that the introductory course can serve to provide a solid foundation addressing the National Educational Technology Standards, but these efforts will need to be supported by a collaborative and integrated teacher education program.

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ENHANCING EDUCATORS' COMPUTER LEARNING WITH THE EMERGING TECHNOLOGY

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Abstract

With the emerging technology highlighting hypermedia and the Internet, educators are finding ways to modify the traditional ways of teaching and learning. The need of infusing the Web in education is evident in two surveys of our college students and faculty members as well as a result of a national survey of teachers. To fully maximize the power of the Web to enhance instruction, this paper presents a working model detailing related issues and experiences in a few computer courses, based on a three-level Delta learning theory, containing: (a) technology used as originally intended; (b) technology applied in new ways; and (c) technology as a necessary component of any application. This paper also discusses the various ways in which technology can contribute to better instruction, inspiring students to learn through working cooperatively and collaboratively.

Introduction

Currently, the emerging computer technology which includes hypermedia and the Internet, is drastically changing education. Hypermedia is the combination of both hypertext and multimedia which have a great potential to offer education (e.g., Boyle, 1997; Bagui, 1998; Stoney & Oliver, 1998). Abstract concepts may be presented with concrete examples. The hypertext-based, multimedia applications, or the so-called hypermedia applications, can be made highly interactive in the formats of tutorial, drills and practice, simulations, and entertainment games. Students can explore the hypermedia-based virtual reality as presented in the multimedia software and learn to take control over their own learning and construct new knowledge through such exploratory experiences. High quality course contents may be organized, developed, and disseminated in cost-effective manner for either formal instruction, distance learning, or remedial training purposes.

Hypermedia and the Internet have become an indispensable means to realize such a mission. Hypermedia-based applications can provide a highly interactive learning environment where students build up their own knowledge. With exciting audio and visual elements in the programs, students can master abstract concepts with concrete examples and illustrations. The introduction of the Web has resulted in teaching methods, and teaching and learning styles being changed from the traditional lecture-discussion modality to that of the student-centered learning (Roblyer, Edwards, & Harviluk, 1997). The teachers' and professors' role has also been changed from that of a traditional figure, dispensing knowledge and information to that of a facilitator of learning. As the popularity of the Web increases, so does the number of potential uses in higher education. With both faculty and students, the Web is becoming a very significant component in education at all levels. As Powell (1998) pointed out, the Internet can support lifelong learning because its usefulness does not terminate with graduation.

By its nature of inter-connectivity and huge amount of resources, the Internet and the Web can promote research. Pan (1999) indicated that technology-based research has a great potential to improve the quality of teachers' performance and suggested that higher education teacher preparation programs should engage preservice and inservice teachers in action research with the new technology. Ackermann and Hartman (1998) indicated that the Web has profound effects on the way we find information and conduct

research. Using the Web for better education has become an ultimate mission and for this reason, a Web-enhanced instructional model is highlighted in this paper.

Technology, especially the Web-based application with the advantage of hypermedia and the Internet, is not just for science and business anymore; it is for our everyday life. The Web has, in reality, become a new fashion in education. With widely available resources, students, teachers, and college professors are learning how to use it and explore ways to maximize the learning outcome with the Web-based activities. Technology integration is deemed as an ultimate goal in most education reform plans. Morton (1996) suggested that technology should be integrated when it is used in a seamless manner to support and extend curriculum objectives and to engage student in meaningful learning.

The Reality of Computer Use in Education

To address the needs of school computer use and to prepare new teachers to know how to integrate computers in their work, it is important to know the reality of how computers are being used at various levels. In a recent survey of all the faculty members in the School of Education at our institution, the results showed that most of those who responded to the survey were aware of the importance of the emerging computer technology in education and they were interested in integrating computers in their curricula. These respondents also indicated that the computer lab resources were inadequate for their instructional needs that are very high. Also, more and easier access from anywhere and anytime was requested. Hypermedia-enhanced materials and the Web has definitely become the more desirable resource to meet their instructional needs.

In another survey of 60 preservice teachers in the School of Education, the results showed that 90% of these teachers had easy access to a computer and the Internet. Nearly everyone, 97%, has used one of the word processing programs to prepare written documents, knew how to send e-mail messages, and had some experience using the Web to surf or to search for resources. However, even if they used the Internet and the Web everyday, most did not know how to find material that is relevant to the lesson they are teaching or how to use the materials wisely for instruction or administrative tasks. These students expressed their interest in learning how to integrate the Web into teaching and to engage their future students in tasks that will help them master the content and further their accomplishments. Currently, many studies and reports show that the utilization of the Web has become a major force in teacher preparation programs. (Robin & Miller, 1998; Ivers & Barron, 1998)

In the schools, teachers are adopting the Web for their instruction and finding it an essential tool. In the Education Week's 1999 National Survey of Teachers' Use of Digital Content (Fatemi, 1999), the results showed that 9% of teachers surveyed use Web sites as their primary resources for instruction, 88% use it as a supplementary resource, and 3% use it as a "quiet time" or "bonus time" activities for students. These studies indicate that the use of the Web for instruction is expected to grow continuously in the near future. Likewise, the hypermedia-enhanced applications, very often the equivalent component to the Web, have gained significant importance in education.

The Potential of the Emerging Technology for Better Teaching and Learning

- It presents a new way of learning via inquiry and exploration. Students with all sorts of learning styles can benefit from using it. It promotes student-centered learning activities in which students take control of their own learning and build their own skills and knowledge with meaningful processes and tasks.
- It offers a new partnership between teachers and students in exploring the learning tasks together.
- It provides access to a vast volume of information anywhere and at anytime it may become available.
- It help teachers as well as students to stay current with the newest resources.

- Communication all over the world has made possible learning from people with different cultural backgrounds.
- It allows and encourages cooperation and collaboration between students.
- It makes available hyper links, a major part of the Web, so those teachers may easily direct their students to explore and learn.

Concerns and Issues

The following issues are the primary concerns when developing an effective model for teaching and learning with the emerging technology.

- How much should they learn?
- How can we help students get started and engage them in dynamic learning?
- What should we do to maximize the power of the Web and hypermedia for instruction?

Although the emerging technology provides a great potential for education, it contains many critical issues concerning its usefulness and effectiveness for education. Zehr (1999) indicated that educators have a lot of digital content to choose from, but not all is worth using in the classroom. Simply having students use the Web or hypermedia-based applications for resources does not guarantee successful learning. How to motivate students and how to guide them to explore the huge realm of resources and make sense out of the information becomes a more critical task.

There are a few misconceptions and inadequate practices in using emerging computer technology in education. Often, students are spending too much time on technical aspects of learning about computers, instead of concentrating on the content. Technology should be a tool to enhance learning, not its goal. Sometimes, we find that some students try to learn about computer tasks by memorizing facts and non-essential information in order to pass a quiz. In fact, the most important aspect of learning with and about computers is to learn how to learn in order that they will be able to adapt in the future as new technologies emerge.

Throughout many years of experience, we found that the best way to integrate computers into curriculum is to support learning with relevant materials and to engage students in active hands-on experience. We also found that students tend to accomplish more when they are inspired to pursue their self-defined learning goals and when they are supported by each other through working or connecting with real people and real projects.

To make a profound impact on education with computer technology, a Web-enhanced instructional model was developed based on Schwartz and Beichner's (1999) Delta Principle, which contains three levels: (a) technology used as originally intended; (b) technology applied in new ways; and (c) technology as a necessary component of any application. The Delta principle actually advocates an implementing approach, with which technology will become an integral part of education, and both teachers and students will unconsciously depend on the power and convenience that technology can provide. Teachers especially will find great value in technology and consequently change their way of working.

This model was implemented in several computer courses, including Computer Literacy, Computer Applications for Educators, and Computer Applications for Administrators. These courses have the potential to play a more significant role in our teacher education program. These courses can also provide an authentic context for both preservice and inservice educators to examine instructional practice and reflect on their learning as they acquire new skills and content. Course activities are designed with a scenario, and within this scenario, teachers will utilize the given technology in an exemplary manner, thus providing a positive model for their students and other teachers. The characteristics of this model include the following features.

- A new partnership between faculty and students
- Setting up a learning goal.

- Conducting a meaningful study based on individual experiences and goals.
- Presenting and contributing to the entire group learning accomplishment.
- A new student-leadership through collaboration and cooperation

In this model, students started developing basic experiences with the Web as in a Delta Level I and II where they developed good strategies of searching and using the Web. They then gradually developed concerns about how to bring this technology into their work and teaching in helpful ways. With increased communication among themselves, they relied upon the Web even more than before and used the Web as an essential part of their work.

Prior to taking the courses, most students had limited computer experience. Additional experience that stresses Internet related applications can assist them in the mastering of the skills necessary to meet the challenges of a Web-enhanced learning environment. After learning the required general applications, students were asked to apply their knowledge and skills to some integrative tasks. Appropriate examples might be a written report on information found on the Web, creating a desktop publishing document or generating an on-line presentation.

Students started the course with a great diversity in terms of their computer backgrounds, personal experiences, and individual interests. It is impossible to provide one definite course outline to meet the needs of every one. Therefore, an innovative approach is offered to provide a comprehensive and flexible course outline to address individual students' needs. As shown in Table 1, both the general computer literacy skills and the Web-enhanced learning tasks were emphasized simultaneously to go along with the three levels of the Delta principals. This approach engages everyone in the class in activities that they will be able to grow with and to better contribute to the dynamic learning experience. Access and platform preferences are also a vital issue that affects their learning. Students tend to accomplish more if they can have easy access to computers and preferably if they can do work on a computer platform that's compatible with those used in the class. The Web can help with all of these issues.

Students are taking full advantage of the Internet for their own studies. They find resources, seek answers, and develop connections and communication with others. They are amazed by the rapidity of answers to questions. They are also encouraged by other students contributing to their learning through sharing a great variety of resources, ideas, and experiences. They particularly recognized the role of the Internet in the formulation of new learning strategies and practices. The most evident result was enhanced student collaboration and the interpersonal exchange of knowledge.

Computer Literacy Skills	Technology-enhanced Learning Tasks
• Students build their computer skills with various tasks. • Students extend their applications in both Delta Level I and level II. • Students adopt computers as an essential part of their work and learning. This is equivalent to the Level III tasks.	• Student projects. • Cooperative learning and collaboration. • Contribution to the class via presentations and sharing. • Students develop the Web-based activities as the further applications to realize the Level III tasks.

Table 1: Technology-enhanced learning skills and computer literacy tasks

Courses based upon this model also entail the following exercises:

- Students reflect their own learning process as enhanced by the Web.
- Students can associate teaching and learning practice with learning theories.
- Students are engaged in serious research efforts.
- Students learn from each other by critiquing and discussing the teaching and learning-based experience.
- Students make adequate and reasonable modifications about their learning goals or administrative plans for implementation or reform.

- Students can acquire authentic experience by working with real people for projects or conducting interviews with the personnel in the school.

Educational Implications of the Web

The Web which best represents the emerging technology has made a tremendous impact on today's education on several counts.

Firstly, the Web presents information in the hypermedia format using the combination of the hypertext and multimedia. The hypertext allows the information being accessed through a non-linear sequence so that users may click a button or a hot word to go to a different page/screen on a computer or can retrieve a piece of information or an image. The multimedia can enhance the information display dynamically with sounds, graphics, animation, audio clips, and video clips.

Secondly, the Web can reach students far and near. With an access to the Internet from home or work, students can easily gather information and resources and participate in discussion and communications. In the past, our student had to go to libraries to check out information or had to visit the campus computer lab to work on specific assignments. Presently, they can get on-line from home and conduct even more sophisticated projects than ever.

Thirdly, the Web provides a wide array of information and topics to suit individual needs. The Web allows a great variety of activities where students can browse, search, research, ask and discuss questions or issues, and contribute to the building of new information via Web page construction.

Lastly, the Web promotes communication between people. Students tend to learn more from each other or from real people in the field through cooperation and collaboration.

Examples of Assignments and Exercises

- To identify and discuss how computer technology and the Internet affects the culture of the school and the relationships among administrators, teachers, students and parents.
- To list and describe some of the many programs located on the Internet that are available and valuable to administrators, teachers and students.
- After learning how to develop Web pages, databases and spreadsheets through available tutorials on the Web, develop real or hypothetical applications that could increase financial support and improve teaching and learning in a school or school district.
- Interview school administrators, teachers and other appropriate individuals and determine the criteria, process and the rationale used in the school or district to select computer hardware and software, to initiate a staff development and support program
- Develop a power point presentation such as "Harnessing the Power of the Internet" and present the same to classes and/or other appropriate groups.
- Develop a **"School Internet Use Policy"** based upon legal and ethical principles, as well as the wealth of experience gained in the recent past.
- Explore how electronic communication and collaboration with other individuals, groups and institutions such as libraries, museums and schools can result in sharing knowledge, skills, values and cultures.

Minimize the Obstacles and Maximize the Learning Outcomes

- Differentiate surfing from searching and researching. Students may start with some Web surfing and experience. They should be encouraged to conduct more significant research tasks and develop powerful search skills using electronic tools.
- Increase efficiency with proper management of time and stay focused with the intended topics.
- To avoid being overwhelmed by too much irrelevant information, help students develop strategies to screen information. For security purposes, teachers should go through most of the possible Web sites before they send students to do it.
- Address important issues, such as ethics, copyright, and plagiarism.
- Maximizing the Web by making the Web more interactive by adding components such as Web-based discussion, e-mailing, and so on.
- When creating on-line publication on the Web, keep users in mind. Avoid loading too many big graphics or multimedia elements.

Summary

The emerging technology has provided a tremendous potential to enhance instruction. In order to integrate hypermedia-enhanced applications and the Web technology into instruction, an instructional model was developed. When implementing this model in various computer courses, students improved their computer literacy skills while they learn how to maximize the power of hypermedia and the Web for better instructional needs. This model can be characterized by various elements, including self-defined goals, hands-on computer experiences, real-world projects, and sharing through cooperation and collaboration. As indicated in the Delta principles, students made progress as they gradually acquired their computers skills and contributed to the Web-based information development. They learned strategies through the completion of various projects and eventually used the computer and the Web as an essential part of their life.

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A Collaborative Course Portfolio: The Core Curriculum of a Core Course

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Abstract: Core courses are those which are deemed to be essential to a major, whether in Teacher Education, History or English. Typically there are several sections of core courses, not all taught by the same persons. How do we engage faculty in the process of ensuring equality across faculty and sections of core courses? Indeed, how do we ensure equality across sections of core courses? This paper presents a model to ensure coherence and continuity across sections of a core course on the infusion of technology in education through a case study of one technology course at one large urban university.

Core courses are essential to any major. Typically there are many sections taught by many people, including full time faculty, graduate assistants, and adjunct faculty. With the diversity of people teaching these courses, how do we ensure equity across sections? Clearly teaching styles vary across faculty, but core courses are by nature intended to teach basic knowledge for the discipline, upon which higher level courses expand. This means that core courses cannot vary in basic information taught or learned, but must have common basic outcomes across sections. However, how do we ensure this?

This paper presents a case study of an ongoing project for faculty teaching a newly revised core course on technology in education. A teaching circle was formed where faculty discuss, collaborate and compare across sections, with the end product to be a Collaborative Course Portfolio. The faculty participating in this teaching circle include 3 full time faculty, 4 adjunct faculty, and 1 graduate student, out of the total of 11 faculty teaching the course during the fall 2000 semester. The other 3 instructors were unable to participate due to work schedules. This process will continue during the spring 2001 semester, with a core of 2 full time and 3 adjunct participating. While it would be nice to have continuity in all faculty teaching core courses, scheduling does not always permit this outcome.

This group met bi-weekly since mid-August 2000 to discuss issues of lesson sequencing, selecting a textbook that better fits the revised curriculum, and assuring each section meets the four themes of the undergraduate teacher education curriculum. These four themes are: inclusion and diversity of students, authenticity of learning experiences, reflective learning, and infusion of technology. Clearly, this course addresses the last theme by virtue of the nature of the course itself; however, the other three themes are not as easy to ensure. To help in keeping track of the activities of the teaching circle, a graduate assistant took notes and began the process of developing the collaborative course portfolio.

It should be pointed out that the teaching circle developed this year is the outcome of two processes. During the 1999-2000 academic year, four of the eight teaching circle faculty met bi-weekly to develop a mutually acceptable set of core course guidelines, which provided a common set of learning objectives and student projects for all sections of the course. This group collaboration provided the foundation for the discussions this year. Secondly, this author applied for and was awarded a Carnegie Scholarship, which focuses on the process of developing the teaching circle, expanding that circle to include faculty who teach specific subject matter, and developing an overall course portfolio to chronicle the collaborative efforts of the group and provide guidance to faculty who teach this course in the future.

One challenge to the teaching circle has been to avoid focusing on technical issues rather than on substantive issues of the course. Given the fact that we teach a course that is about technology, it is quite easy to discuss the technology issues (e.g., problems with lab equipment, student problems with equipment, scheduling) rather share experiences and materials. This group has on occasion fallen into this trap, but the group facilitator has managed to bring the discussion back to issues of substance for the course by relating the technology issues back to the course. Students can learn from technology glitches they may face in their own classrooms, and how we as faculty handle these problems within the course.

In addition to the faculty who teach the technology course, faculty who teach specific subjects that education majors take were invited to participate in the teaching circle. The reason for this expansion of the teaching circle is that the technology course is a core course; therefore, the teaching methods courses should expand upon what is taught and learned. However, if the teaching methods faculty are unaware of what is taught and learned in the technology course, how can they make use of the skills and knowledge in their courses? Likewise, if the faculty who teach the technology course are unaware of technology skills required in the teaching methods courses, they cannot ensure the students are prepared appropriately. Hence, the discussions have begun with someone from Math Education and Social Studies Education. This discussion has been quite fruitful for many reasons. One example is that the revised course focuses on infusing technology into teaching through lesson plans, not merely learning how to use educational software. This is not the course responsible for teaching students how to write lesson plans, but it should not contradict those courses that do. In sharing course outcomes and materials with the faculty member from Math Education, we discovered we were indeed supporting the process taught through their courses. At the same time, the faculty in Math Education discovered that the students are expected to write lesson plans in the technology course specifically focusing on the infusion of technology into the teaching and learning enterprise, rather than on specific knowledge.

The Collaborative Course Portfolio follows one model discussed by Lee Shulman (1998). This model is one of chronicling the process of the course teaching circle, with an analysis of the outcome after the end of the semester. The analysis is a reflective analysis looking back at the discussion and contribution by members of the teaching circle. This information will be shared back to the group the next semester to help determine the direction of discussion. The course portfolio will be available through this author's web site: http://nimbus.temple.edu/~schifter

How can this process be applied to other subject areas or disciplines? The concept would be the same in developing a teaching circle. Getting core faculty to get together on a regular basis to discuss substantive issues common to their courses begins the processes. Chronicling these discussions so they provide guidance to future teachers of the core course is key to making these discussions truly fruitful. The course portfolio provides an opportunity to discuss publicly the similarities and differences across and between sections, and to invite comment and critique from colleagues. The collaborative course portfolio contributes to knowledge about engaging faculty in new teaching practices that highlight the scholarship of teaching and collaboration of colleagues.

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